# Health inequalities and mental health service use in mental-physical comorbidity

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# Health inequalities and mental health service use in mental-physical comorbidity

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This thesis is submitted for the degree of Doctor of Philosophy

January 2015

## Abstract

Although mental and physical health are likely to share common social causes, most mental-physical comorbidity research has focused on immediate mechanisms between mental and physical illness. This thesis takes a social epidemiological approach to mental-physical comorbidity, where social disadvantage and the disproportionate availability of resources are central. The amplified burden of comorbidity in terms of poor health and functioning may have implications for the relationship between comorbidity and mental health service use (MHSU). Whilst much research examines the impact of comorbidity on physical health services, MHSU is under-researched. Furthermore, comorbidity inequalities may be perpetuated through processes of cumulative disadvantage. For example, barriers to social participation may deplete resources over time, thus leading to worse health outcomes and more adverse social circumstances. This project therefore aims to:

1. Estimate the prevalence of comorbidity, and describe inequalities in mental-physical comorbidity by key socio-demographic and socio-economic factors
2. Describe and explain the association between comorbidity and mental health service utilisation and quality
3. Describe the trajectories of social functioning by comorbidity

Analyses make use of survey data from the South East London Community Health Survey (SELCoH) phases 1 (N=1698) and 2 (N=1052) (73% response among those approached at follow-up). Statistical methods used include weighted cross-sectional and longitudinal regression analyses. The results indicate that comorbidity is associated with distinct socio-economic inequalities (most consistently by household income), increased MHSU over time, and persistent social exclusion. This suggests that comorbidity reflects a process of cumulative disadvantage, which has important implications for comorbidity and health inequality research, and local services and policy makers. Altering the downward spiralling trajectories of health and social disadvantage among those with mental-physical comorbidity may be addressed through integrated care models, while interventions aimed at reducing social inequalities may effectively

prevent comorbidity and interrupt its downward spiralling course of disadvantage.

## Acknowledgments

I first of all extend my thanks to the Institute of Psychiatry, Psychology and Neuroscience (IoPPN) for funding my doctoral studies. I would also like to thank my colleagues at the Psychological Medicine department, which have made the department an excellent environment for me to develop as a doctoral student. I am especially grateful for the invaluable academic support that I have received from my supervisors, Stephani Hatch and Max Henderson. Their guidance has simultaneously challenged and encouraged me and allowed me to develop to my full potential.

Throughout my time at the IoPPN I have made many friends who have made my PhD a very enjoyable experience. Lindsey Hines, Stephanie Beards, Billy Gazard, Faith Matcham, and Jorge Palacios have been important sources of peer-support. Jennifer Carter has been an especially important part of my PhD experience as we've closely shared the peaks and troughs of our academic journeys.

Throughout my education I have been privileged to have been taught by many great teachers, but would like to extend a special thanks to my maths teacher Mr Padioukov at Berlin Brandenburg International School. Without the time, patience and energy he unhesitatingly invested in me back then, I would never have been able to perform the types of analyses that this thesis demanded – let alone enjoy them.

I am also grateful for the support I have received from my loving family, and especially from my parents Kerstin Bauer and Jan Aschan. If it weren't for their unwavering support throughout all my education I would not be where I am today.

Finally, I extend my wholehearted thanks to my significant other, Jonathan Harber, for his encouragement and endless support at every step along the way.

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# Chapter 1 Introduction and literature review

## 1.1 Introduction

The frequent co-occurrence of mental and physical illness (mental-physical comorbidity) has been consistently observed in epidemiological research world-wide [1]. The negative implications of comorbidity both to individuals and to society in terms of morbidity, mortality [2–9], quality of life [10–12] and service use [13] has motivated much research into understanding comorbidity. However, most research to date has focused on morbidity-driven mechanisms between mental and physical illness, conceptualising one as a risk factor for the other [e.g. 14, 15, 16]. More recent research considers mental and physical illness as integral, placing special emphasis on stressors in early life as risk factors for both mental and physical illness [1]. However, this research is also limited as it fails to recognise how the wider social determinants of health may contribute to the co-occurrence of mental and physical health outcomes.

This thesis takes a broad social epidemiological approach to understanding mental-physical comorbidity. Central to this understanding is the concept of social disadvantage, conceptualised as limited availability of resources to address challenges to health and effectively manage ill health [17, 18]. The disproportionate distribution of resources to the disadvantage of socially marginalised and vulnerable groups has previously been proposed as an approach to understanding social distributions of separate mental and physical health outcomes. However, the approach has never been applied to mental-physical comorbidity.

Mental illness in the context of social disadvantage may further compromise the resources available to prevent and manage physical illness. Conversely, limited access to health enhancing resources may mean that physical illness has greater implications for mental health among vulnerable groups compared to socially privileged groups experiencing physical illness. These reinforcing effects might lead to greater health inequalities among persons with mental-physical comorbidity than persons with non-comorbid mental or physical illness. However, approaching comorbidity from this perspective has not been done to date.

The availability of resources also has implications for the relationship comorbidity has with help-seeking behaviour and healthcare utilisation. Among those with physical illness, sparse resources to manage the stressors of daily life in addition to poor health may mean that physical illness implicates a greater burden to more socially disadvantaged groups. Thus, irrespective of symptom severity, the subjective burden of illness might be greater among those with comorbidity, and lead to greater service use. Most research to date investigating mental-physical comorbidity in relation to service use has focused on what the added effect of mental illness to physical illness is on the uptake and quality of physical or general healthcare. This literature generally indicates that poor mental health is associated with greater service use [19–23], although not always consistently across specific services [19, 24], while at the same time the quality of care has generally been found to be worse, especially for patients with severe mental illnesses (SMIs) [13, 25–29].

Fewer efforts have been made to understand the impact of comorbidity on mental health service use (MHSU) or to describe the quality of mental health care by comorbidity status. Indeed, MHSU is often discussed as a confounding factor which may not have been adequately accounted for in studies examining the impact of comorbidity general health service use [e.g. 23]. There are nevertheless good reasons why the impact of comorbidity on MHSU may be relevant to explore. Given that there are effective treatments available for common metal disorders (CMDs) with comorbid physical illness [30, 31], and that good mental health may theoretically have positive benefits on physical health through biological and behavioural pathways, inequitable access to mental health services by vulnerable groups could have important implications for mental as well as physical health inequalities. For this reason this thesis will focus on MHSU.

Over time, inequalities in comorbidity may be perpetuated and exacerbated through processes of cumulative disadvantage [32]. Comorbidity may present barriers to engaging in social participation, such as employment and leisure activities. This may further deplete the availability of health enhancing resources (e.g. income and social support) to those with mental-physical comorbidity, thus further contributing to poorer health. Whilst the longitudinal study of comorbidity has previously been promoted [33, 34], the depletion of flexible resources over

time represents an approach that has not yet been applied to understanding health inequalities in mental-physical comorbidity.

In this first chapter the theoretical and empirical literature relevant to comorbidity, health inequalities and MHSU will be reviewed.

## 1.2 The burden of comorbidity

A vast body of epidemiological research has evidenced that, as a rule more so than an exception, mental illnesses coincide with physical illnesses [35–38]. Evidence from both patient and general population samples has found that CMDs and SMIs are associated with a range of chronic physical illnesses including cardiovascular conditions, respiratory diseases, diabetes, cancer and arthritis [28, 38–50].

CMDs and SMIs represent important, but often under-prioritised public health problems. CMDs include depressive and anxiety disorders, many of which are prevalent in the general population [51–54]. Depressive disorders are characterised by a collection of symptoms including low mood, lack of positive affect, tearfulness, irritability, disrupted cognition, and fatigue among other psychological and physical symptoms [55, 56]. Anxiety disorders are primarily characterised by excessive worry or fear and include disorders such as generalised anxiety disorder, obsessive compulsive disorder, panic attacks and phobias [57]. Consequences of excessive anxiety may manifest in behavioural (e.g. avoidant behaviour), psychological (e.g. feelings of guilt and shame) and physical (e.g. heart palpitations) symptoms [55, 57]. CMDs include symptoms that can be considered “normal” responses to distress, and they are therefore best conceptualised according to a continuum [58]. It has also been argued that depression and anxiety should be considered jointly using a dimensional approach given the substantial overlap in aetiology and symptomology of the disorders [59–61] and that they are effectively addressed when treated jointly [62]. At any point in time one in six of the general population will have a CMD; half of which would be considered serious enough to warrant intervention from services [53, 55]. CMDs are often distressing and disabling, and therefore incur substantial individual and societal costs [63]. Indeed, depression is projected to

become the second most important cause of disability world-wide by 2020, and the leading cause of disability by 2030 [64, 65].

SMIs primarily refer to psychiatric disorders containing psychotic components, including schizophrenia, schizo-affective disorders, and bipolar disorder. Psychotic symptoms are characterised by a lack of touch with reality and include unusual experiences such as hallucinations and delusions [66]. Symptoms of psychotic disorders may also include negative affect, social withdrawal and disruptions in cognition [67, 68]. SMIs are less prevalent than CMDs, with a lifetime prevalence of 3.5% in the general population [69]. However, it has been argued that SMIs are best understood as a continuum rather than a binary diagnosis [70], and psychotic symptoms, without necessarily having SMI diagnoses, have been found to be more common in general population samples (5-19%) [70–72]. Although SMIs are less prevalent, those affected by them nevertheless represent a sizeable proportion of the population and experience lower quality of life as a result of the impairment and distressed caused by the illness [73]. The chronic nature of SMIs also means that those affected by them may experience the consequences of it during large parts of their lives. Thus, despite the relatively low prevalence of SMIs, the chronicity of psychotic symptoms coupled with their disabling effect mean that they nevertheless place a great burden on individuals, families and communities [74].

The physical illnesses that most often coincide with mental illnesses are the same that most commonly affect the general population [50]. These include cardiovascular diseases, diabetes, respiratory diseases and musculoskeletal conditions. They are by their very definition chronic and require ongoing management, and are among the leading causes of disability and mortality in high income countries, and increasingly so in low- and middle-income countries also [65]. However, if managed well there is scope to positively influence the disability and mortality outcomes.

Thus, considered separately mental and physical illnesses place great burdens to individuals and society [74, 75]. However, the combined burden of the mental and physical illnesses is additive, and sometimes interactive, such that the impact is greater than the sum of the either the mental and physical condition

on its own [9, 76, 77]. These burdens include functioning impairment, poor perceived health and greater healthcare costs.

### 1.2.1 The burden of comorbidity on perceived health and functioning

Comorbid mental illness among those with chronic physical conditions are associated with greater reporting of somatic symptoms such as pain, fatigue and respiratory symptoms [78–81]. A systematic review found this to be true for both patient and community populations, for a range of somatic symptoms and for the most prevalent types of chronic diseases [79]. This effect seems to be independent of the severity of the somatic illness [79].

Comorbidity also affects many aspects of functioning including objective indicators such as mobility and managing daily tasks [76, 82], as well as cognitive abilities and maintaining social roles [42, 77].

The experience of somatic symptoms and functioning impairment are important aspects of quality of life, which is poorer among those with mental-physical comorbidity compared to those with non-comorbid physical illness [10–12]. However, in comparison to non-comorbid mental illness the impact of mental-physical comorbidity on social and emotional aspects of quality of life are limited, while physical components of quality of life nevertheless are impaired [12, 83–85]. Strongly related, but separate from quality of life, are global perceptions of health [86], which are also poorer among those with mental-physical comorbidity [44].

### 1.2.1 The burden of comorbidity on social outcomes

Comorbidity also has implications for obtaining and maintaining employment among those of working age. Comorbid psychiatric and physical health conditions are associated with more sickness absence and greater unemployment and economic inactivity [87–90]. With an increasingly ageing population requiring retirement pensions and health and social care, maximising the productivity of those of working age is an important future policy goal in order to sustain society financially [1].

### 1.2.2 The burden of comorbidity on healthcare

Chronic illnesses have been argued to currently pose the greatest challenge to public health, especially with respect to the increasing prevalence with the ageing population [91]. However, an important implication of comorbidity is the increased burden it places on healthcare services. All types of services including primary, specialist and emergency services are used more frequently by those with both mental and physical illnesses, and is not explained by greater treatment for mental health [82, 88, 92]. This increased service use incurs great costs to healthcare services [13, 88, 93, 94]. The amplified burden that is incurred when chronic physical illnesses are coupled with mental disorders in terms of lost productivity and healthcare costs, would suggest that the greatest challenge may arguably be mental-physical comorbidity [95].

## 1.3 Current understandings of comorbidity

### 1.3.1 Comorbidity within the contexts of health paradigms

#### 1.3.1.1 Comorbidity within the biomedical model

The biomedical model has been the dominating paradigm of Western medicine [96–98]. Its influence has been pervasive, shaping scientific research, clinical practice as well as lay perceptions of health [96, 99–101]. Core characteristics of the biomedical model include a mechanistic and deductive approach to understanding health [96, 102]. According to the model, “disease” crudely refers to a pathological substrate caused by a single biological dysfunction, giving rise to the subjective experience of symptoms and in turn “illness” [96, 102]. In order to restore the body from illness, the biological cause must be identified and treated or removed. Thus, “health” under the biomedical model is the absence of disease [103]. This conceptualisation of health led to a compartmentalisation of the human body into distinct domains for the subject of specialists to study and treat.

The formative definition of comorbidity, articulated by Feinstein [104], builds on the biomedical idea that disease occurs within confined and distinct bodily domains. Feinstein described comorbidity as “any distinct additional entity that has existed or may occur during the clinical course of a patient who has the

index disease under study" [104]. The index condition refers to the primary illness of interest, while the additional diseases are considered "comorbid" conditions [105]. This definition allows clinicians and researchers specialising in a medical domain to retain focus on their disease or disorder of interest, and the study of comorbidity involves understanding how comorbid conditions exert their influence on the index condition [106].

Another distinctive aspect of the biomedical model, associated to the bodily compartmentalisation, is the separation of mental and physical health [102]. As modern medicine emerged as a discipline, the materialistic and reductionist approach of the biomedical model necessitated a separation of mind and body [107]. Although the philosophical origins of the separation between mind and body can be traced back to ancient times, Cartesian dualism is often cited as having the major philosophical influence on medicine [107–110]. Descartes conceptualised the mind as "divine" and the body as a machine; conceptually separate but interacting with one another [107, 111, 112]. During the formative years of medicine, the mind-body separation was facilitated by the strong societal status of the Christian church, which considered the spiritual aspects of the soul and the psyche as belonging to its religious realms, and not to the subject of medicine [102, 107, 112]. This led to mental illnesses being neglected from the domain of medicine for a long time, until psychiatry in the 19$^{th}$ century was established as medical discipline in its own right, although considered lesser than other medical disciplines [102]. With the technological and methodological developments of the 20$^{th}$ century genetic, neuroanatomical, hormonal and other biological components of mental illness emerged [113]. This has had the positive effect of psychiatry being increasingly accepted in medicine, and spurred on more research into mental health. However, a downside to this development is that the social elements of mental illness have been transformed into biological entities, leading to a "medicalisation" of mental illness [107]. Indeed it may be argued that mental illnesses became recognised as medical illnesses because of the increasing evidence from biological fields, allowing them to fit into the biomedical paradigm of medicine.

The biomedical approach to mental illness can be detected in Feinstein's definition of comorbidity describing the co-occurrence between distinct disorders and conditions, where mental illness is considered as one of many

conditions that may or may not be comorbid with others [104]. The definition therefore makes an implicit assumption that comorbidity of two or more conditions has similar implications whether or not they include mental illnesses.

#### 1.3.1.2 Comorbidity within the biopsychosocial model

Although the biomedical model has served as a successful paradigm of medicine with respect to biological understanding and treatment of somatic diseases as well as psychiatric disorders, it has received increasing criticism and been described as being in a state of “crisis” [102, 112]. This is due to accumulating evidence in fields of epidemiology and social sciences, which the biomedical model is unable to account for [102]. One of the most important challenges to the biomedical model is that illness is consistently distributed according to hierarchically ordered social statuses in the population [102]. The fact that these patterns apply to a range of physical as well as mental illnesses strongly suggests that social factors play an important role in health and illness. A second important challenge to the biomedical model is evidence indicating that the effectiveness of treatment is highly dependent on the context in which it occurs [100, 114].

In response to the accumulating challenges to the biomedical model, the biopsychosocial model was developed as an alternative approach to medicine, and has become increasingly influential in research and clinical practice. The biopsychosocial model, proposed by Engel [102], promotes a systems-based approach to understanding illness centered around the person. According to the model, a person is influenced by biological, psychological, and social factors, which in turn affect illness and treatment outcomes.

While comorbidity according to the biomedical model is mostly concerned with how comorbid conditions and their treatment regimens biologically influence an index condition, the biopsychosocial model takes a more holistic approach to health which allows for a more comprehensive understanding of comorbidity. Within the holistic approach attending to the health of a whole person it is less relevant to designate one condition as the index condition, as all health conditions are likely to contribute to the health and wellbeing of the person [115]. From this holistic approach to health the term “multimorbidity” has emerged to indicate the co-occurrence of multiple conditions, without attributing

one condition as an index condition [116]. This approach is often used in primary care practice and research [106, 117]. Whilst comorbidity and multimorbidity have often been used interchangeably in the literature, the differential emphasis on an index condition is a valuable distinction to make [105].

With the recent recognition that mental and physical illnesses share common genetic, neurological and social causes, the biopsychosocial model has become increasingly applied to research and healthcare. This has resulted in a gradual shift towards more holistic care emphasising treatment of the whole person in policy and practice [118], and greater patient involvement [119, 120]. Recent conceptualisations of comorbidity and multimorbidity have also been influenced by biopsychosocial approaches by increasingly considering social factors [121].

#### 1.3.1.3 Comorbidity as co-occurring mental and physical illness

It therefore seems that the biomedical model does not allow for a comprehensive understanding of mental-physical comorbidity, but that a shift towards a biopsychosocial approach is necessary. Although the term "multimorbidity" is more closely aligned with a biopsychosocial understanding of health, the term comorbidity is used in this thesis to make reference to co-occurring mental and physical illnesses, given the psychiatric epidemiological approach that is applied. This is consistent with previous work [35, 109].

### 1.3.2 The general association between mental and physical health

The comorbidity literature to date has been influenced by a compartmentalised biomedical understanding of health, as most research into comorbidity is disease- and disorder-specific, focusing on specific associations between mental disorders and physical illnesses. Some extensively studied associations include depression and cardiovascular disease [14, 47], and depression and diabetes [122–124], for example.

However, evidence points towards the fact that mental-physical comorbidity is not specific to any particular physical disease or mental disorder but that the association is general. For example, the overlap between mental and physical conditions appears to be a phenomenon found worldwide. Recent research from the WHO Global Mental Health Surveys found that CMDs were consistently associated with a range of physical illnesses, in a wide variety of

cultural contexts, and in high-income as well as in low- and middle-income countries [1, 38, 43].

Research further suggests that comorbidity is not limited to severe mental or physical illness in clinical populations, but extends to community populations. For example, a recent review found that physical comorbidity was a problem equally relevant to psychiatric patients, general population samples, and also to those with subthreshold mental health problems [125]. Further, the prevalence of mental illness among those with physical illness has been found to not vary substantially between inpatient, outpatient and general populations [126]. This suggests that mental comorbidity is not limited to patients with severe physical conditions, but that also physical illnesses that do not require the attention of secondary services are associated with mental illness.

The literature also indicates that comorbidity is not specific to any specific set of mental and physical illness combinations. Although the strength of the associations between specific mental and physical illnesses vary [127], the patterns are inconsistent and there is no consensus regarding which combination of mental and physical illnesses that are most strongly associated [128]. In fact, recent evidence suggests that the prevalence of CMDs does not substantially vary by specific physical illnesses [126, 129, 130], and conversely that the prevalence of different physical health conditions does not substantially vary between mental disorders [130, 131]. Evidence from a study comparing primary care patients with and without SMI indicated that whilst the prevalence of physical illness was consistently elevated among the SMI patients, the morbidity prevalence distribution was similar to the patterns observed for patients without SMI [50]. Furthermore, the implications of comorbidity in terms of quality of life do not vary between combinations of mental and physical illnesses [132].

In contrast, there is a good amount of evidence indicating that the risk of mental illness increases with increasing numbers of physical health conditions [42, 44, 126, 129, 133], and similarly that the risk of physical health problems is associated with the accumulation of psychiatric disorders [38]. This pattern of comorbidity indicates a clustering of health problems, suggesting that an increasing burden of mental and physical illness increases the likelihood of poorer outcomes for the other.

### 1.3.3 Mechanisms of comorbidity

Comorbidity mechanisms may broadly be classified into “morbidity-driven” and “broad” mechanisms. Morbidity-driven mechanisms refer to ways in which mental illnesses influence physical health, and conversely how physical illness exerts a risk for mental illness. In contrast, broad mechanisms refer to joint risk factors of mental and physical illness onset, which may also facilitate morbidity-driven mechanisms and exert influence over the course of mental and physical illnesses. Research on morbidity-driven and broad comorbidity mechanisms is outlined in the respective sections below.

#### 1.3.3.1 Morbidity-driven mechanisms

The vast majority of research into mental-physical comorbidity has focused on exploring morbidity-driven mechanisms [35, 134]. The most commonly researched mechanisms include those that relate to health behaviours, physical healthcare use, psychosocial stress and biological mechanisms. Mental illness has a negative impact on health behaviours (e.g. exercise, diet, smoking, alcohol use) [26, 135–139] and are thus often described as plausible mechanisms of mental-physical comorbidity [140–142]. Health behaviours have been extensively researched in relation to physical health outcomes, especially among psychiatric patients, partially because they are perceived to be amenable to social intervention [143–145].

The quality and uptake of physical health services among those with mental illness is also poorer and has thus been considered a morbidity-driven comorbidity mechanism [25, 28, 29, 49, 146–151]. Adherence to treatment regimens and medications for physical illnesses have also been found to be poorer among those with mental illness [42, 152], possibly due to lack of motivation, fearfulness, avoidant coping strategies and lifestyle factors [35, 153–155]. Those with poor mental health also frequently report barriers to care [27, 156], as well as poorer satisfaction and with care and communication with doctors [156, 157].

Further, the psychosocial burden of living with chronic physical illness is thought to contribute to psychological distress, which in turn may develop into a mental disorder. This has been referred to as the “psychological burden hypothesis” [45, 124]. This burden is likely to stem from anxieties around future medical

complications or life prospects, a restricted lifestyle due to disability or strict treatment regimens, social isolation, adjustment to the chronic physical condition, and perceived functioning limitations [45, 158, 159]. The psychosocial burden hypothesis has been supported by evidence suggesting that the knowledge of diagnosed diabetes is associated with depression, while depression was not elevated among those with undiagnosed diabetes [160]. Chronic illness may also indirectly impact on mental health by contributing to broader life stressors by presenting challenges to managing roles at work and in the home, triggering life stressors such as job loss or divorce [161]. Chronic illness may also undermine the personal resources necessary to cope with stress, by impacting on lowered self-esteem and a sense of mastery [161]. Depression has also been found to be “stress generating” which could precipitate the continuity of depression and also increase the risk of physical illness [162]. Increased stress as a result of a mental or physical illness may deplete resources to engage in health promoting behaviours, such as preventative health behaviours (e.g. smoking) and limiting the impact of illness through adherence to treatment regimens [142].

In addition to health behaviours, physical health care and psychosocial factors, a surge in research exploring biological mechanisms has recently emerged. Most research examines specific mechanisms between mental illnesses and particular physical diseases, including immunity functions, inflammation, neurotransmitters, autonomic dysregulation, stress and hormonal pathways, and genetics [47, 158, 163–165]. For example, it has been hypothesised that molecular changes due to disease generate inflammatory responses involving the release of pro-inflammatory cytokines which affect the brain and induce alterations in mood and symptoms of depression [166]. However, biological mechanisms are unlikely to fully account for associations between somatic illness and psychiatric disorder. If this were the case, a dose-response relationship between clinical markers of disease severity and risk of depression should exist, but such observations are rarely made [167].

The research suggests that morbidity-driven mechanisms between mental and physical comorbidity are bidirectional. The argument is supported by longitudinal epidemiological research indicating that mental illness is prospectively associated with physical illness, and that physical illness is

prospectively associated with mental illness [15, 16, 168–178]. Thus, there is a consensus that the associations between mental and physical illness are bidirectional [45, 46, 164, 179].

Although research has had much success with identifying a multitude of pathways though which social, biological and psychological mechanisms operate between mental and physical illnesses, a bidirectional mechanisms approach nevertheless has important limitations for understanding comorbidity. Consistent with Cartesian dualism, it takes the stance that mental and physical illnesses are independent from one another, exerting separate influences in either direction. As a result of these limitations, a more recent trend in the comorbidity literature draws attention to broader causes of comorbidity, outlined below.

#### 1.3.3.2 Broad mechanisms of comorbidity

Broad risk factors of mental-physical comorbidity include those which may directly impact on the risk for both mental and physical illness, but may also facilitate morbidity-driven pathways such that comorbidity becomes more likely in the context of non-comorbid mental or physical illness [35]. Research examining such risk factors conceptualises mental and physical illness as integral to each other, rather than as separate constructs exerting bidirectional independent effects [1]. The research on broad comorbidity mechanisms include biological vulnerability, psychosocial stress, adversity during childhood and throughout life, and to a lesser extent SES [35, 109, 180, 181].

Genetic vulnerability has been explored as a broad explanation for specific disease combinations such as depression and cardiovascular disease or diabetes [92, 182]. Genetic vulnerability could potentially also modify morbidity-driven biological mechanisms (e.g. inflammation) among those with physical illnesses such that depression becomes more likely. Conversely among those with depression, a genetic vulnerability may facilitate biological mechanisms leading to poor health outcomes via inflammation pathways, for example [183].

However, biological vulnerability mechanisms are likely to be disease-disorder specific, or specific to a particular aetiological state (e.g. illness onset). However, these specific types of mechanisms are unlikely to account for the widespread and non-specific co-occurrence of mental and physical illnesses. If

this were the case, specific mechanisms would need to exist between nearly every mental and chronic physical condition. Instead, it seems more plausible that factors which are generic to both mental and physical illness, give rise to the general and universal patterns of comorbidity. In order to describe these factors, Von Korff has recently coined the term “broad-spectrum risk factors” of comorbidity. These refer to risk factors which act as shared causes of a range of disorders and diseases, and exert effects throughout multiple stages of the condition from onset, through course, recovery, recurrence, and illness adaptation [1]. These may include childhood adversity and low SES.

Recent developments in the field of epigenetics extend work on biological vulnerability by taking the social environment into account such that they may become considered broad-spectrum risk factors according to Von Korff’s conceptualisation. Stressful life events in childhood and adulthood are important both to the aetiology of CMDs as well as SMIs [184–189], and also influence adult physical health outcomes [173, 190–192]. Recent research suggests that these associations may be explained by epigenetic mechanisms [193–197], such that stress exposure alters gene-expression and increases the probability of a disease or a disorder given the presence of genetic susceptibility [198]. Allostatic load has similarly been proposed to explain how accumulated stress throughout the life course “wears and tears” on bodily systems, making them more susceptible to psychiatric and physical illness [188, 199–202].

Whilst psychosocial stress and biological vulnerability provide plausible theoretical frameworks for understanding comorbidity, they fail to consider the potential importance of the broader implications of social disadvantage in comorbidity. This may limit their explanatory power. For example, in the most extensive research project of mental-physical comorbidity to date, the Global Mental Health Surveys explored the effect of childhood adversity on adult mental-physical comorbidity for a range of physical health conditions [1]. Results indicated that the association between early onset CMD and the majority of the physical health outcomes were not fully accounted for by adverse childhood experiences, suggesting that early life stress may not represent a fundamental determinant of comorbidity [203]. However, the study did not account for wider sources of disadvantage arising from low SES or vulnerable social statues such as ethnic minority or migrant statuses.

Although broad-spectrum risk factors of comorbidity such as SES have been acknowledged in the literature, most research tends to place greater emphasis on morbidity-driven behavioural mechanisms such as self-care, adherence, and health behaviours, and biological mechanisms [92, 204, 205]. These types of mechanisms may have received greater attention due to a perception of them being modifiable and therefore relatively easy targets for clinical and behavioural intervention. Broad-spectrum factors such as childhood adversity and SES are arguably more challenging to modify.

However, whilst morbidity-driven mechanisms may offer opportunity for targeted intervention, addressing broad-spectrum risk factors is likely to have larger population-level impact, given that they are influential at multiple stages in the course of both mental and physical illnesses, and generic to many disorders and diseases [1]. Broad-spectrum mechanisms may therefore also hold more explanatory power for understanding comorbidity from an epidemiological perspective. Social disadvantage represents a broad-spectrum risk factor that has been under-researched to date. Whilst social distributions in both mental and physical health have already been widely acknowledged in the field of health inequality research, limited research systematically explores mental-physical comorbidity by social disadvantaged statuses.

## 1.4 Health inequalities

Health inequalities are social, economic or political group differences in health that reflect differences in status, power or resources [206]. Health inequalities are avoidable and are therefore commonly considered unfair. Furthermore, health itself determines the ability to fully participate and function in society [207], meaning that systematic differences in health also have implications for life prospects. This has led some to argue that health inequalities are a matter of social justice [206].

Abundant evidence documenting health inequalities demonstrates that they are pervasive, persistent, universal to high-income and low- and middle-income countries, generic to mental and physical illnesses, and exist in many psychiatric disorders and somatic conditions [208–210]. The physical health outcomes for which inequalities in morbidity and mortality have most

consistently been observed are the very same that are the most prevalent and burdensome to society, namely the prevalent chronic conditions such as cardiovascular disease, diabetes, hypertension, respiratory diseases, and musculoskeletal conditions [211].

The definition of health inequalities encompasses a breadth of social statuses according to which variations in health would be considered health inequalities, including age, gender, ethnicity, race, migrant status, sexual orientation, gender identity, religious beliefs, political affiliations, and SES according to wealth, education, social class, employment or income [212]. Whilst SES is by far the most extensively studied social status, followed by race and ethnicity, (especially in the US), evidence consistently shows that a wide range of health outcomes vary according to social statuses such that the disadvantaged, vulnerable, marginalised and deprived social groups experience poorer health outcomes [213–221].

Health inequalities, most notably by social class, have for a long time been an important topic for UK research and policy [222]. Inequalities in mortality have been documented since the 1800's with the introduction of the Registrar General Social Classification of Occupations serving as an indicator of social class and SES [222]. The Black report, commissioned by the Labour Government in 1977, represents a landmark in health inequality research [223]. It put forward the case that universal healthcare alone could not eradicate health inequalities, but that wider social determinants needed to be considered in order to address the social distribution of mortality [223]. The subsequent Whitehead report, Acheson report and the most recent Marmot review have continued to document and raise concern over persistent socio-economic health inequalities in British society, and put forward the case for examining social determinants of health [213, 224, 225].

### 1.4.1 Theoretical health inequality approaches

Although behavioural, biological and psychological mechanisms all contribute towards explaining health inequalities, the persistent social patterning of health strongly suggests that health inequalities have social origins [213]. Relative

inequality and “fundamental social causes” are two of the most prominent social theories of health inequality. These are described below.

#### 1.4.1.1 Relative inequality

The findings from the seminal Whitehall studies I and II have been used to put forward an argument emphasising the importance of relative inequality and psychosocial stress in explaining health inequalities. The longitudinal Whitehall studies of civil servants played a significant role in advancing the understanding of social determinants of health beyond material conditions of poverty and health behaviours [226]. Research from Whitehall I showed that the most important modifiable risk factors of cardiovascular disease (smoking, exercise and diet) only partially accounted for the socio-economic gradient in cardiovascular mortality [227, 228]. This suggested that unmeasured social factors accounted for the residual association [229]. Whitehall II was set up by Marmot to specifically explore the social determinants of health inequalities [230]. The findings demonstrated that among civil servants with stable and safe employment conditions, a social gradient was observed such that those of higher occupational class were of greater risk of psychiatric and physical morbidity than those of lower social class [226, 231]. This advanced the understanding of social determinants of health by showing that health inequalities were not simply due to material deprivation of the very poor, but extended across social classes.

Marmot argues that the Whitehall findings indicate that health inequalities are driven by perceptions of social status relative to others in a social hierarchy. Marmot acknowledges that other factors associated with “status” (e.g. education, material deprivation, health behaviours) also contribute to socio-economic health inequalities [229, 232]. However, relative inequality is emphasised as the key explanatory factor of social gradients in health, over and above material circumstances, healthcare access or health behaviours [229, 232]. Psychosocial stress represents the proposed mechanism operating between perceived social status and mental and physical health outcomes. Marmot hypothesises that the perception of low status is inherently stressful, due to stress-related feelings such as lack of control and social exclusion [232]. In turn, psychosocial stress adversely affects mental as well as physical health through psychological and biological stress processes [232].

A similar emphasis on relative inequality and psychosocial stress has been promoted by the work of Wilkinson and Pickett [233]. They contend that low perceived status generates feelings of subordination and social exclusion, which constitute key sources of psychosocial stress [233, 234]. This theory has been supported by studies indicating that societies with greater income inequality are associated with greater health inequalities [235]. The mechanisms of psychosocial stress and social integration are proposed to operate between perceived status and health such that greater relative inequality generates feelings of lack of control, greater insecurity, lower self-esteem, and less social connections for people of lower social status. These factors adversely affect health directly through biological mechanisms, as well as indirectly through poor health behaviours used as coping strategies [233]. Research indicating that physiological markers of health are graded according to the social hierarchy among primates has been used to support the argument that low social status is in itself stressful and directly detrimental to health, independent of healthcare access, material circumstances or health behaviours [232, 236, 237].

#### 1.4.1.2 A critique of the relative inequality and psychosocial stress theory

Whilst there is a consensus in the literature that psychosocial stress is detrimental to mental as well as physical health [188, 201, 202, 238], there are important limitations with psychosocial stress of relative inequality as a general approach to explaining health inequalities.

One of the most important limitations with the relative inequality explanation concerns the ambiguous conceptualisation of status. For example, Marmot and Wilkinson and Pickett describe their theoretical approaches as general explanations of “the social gradient” in health. Marmot uses social class and educational qualifications interchangeably to represent social status [229], whilst Wilkinson and Pickett typically use income as a proxy of social standing [235, 239]. The interchangeable use of these constructs to represent “the social gradient” suggests an implicit assumption that perceptions of social status do not vary according to these different social statuses. The narrative also

suggests a conceptualisation of social status as one underlying construct, primarily informed by SES, which can be captured by a number of socio-economic measures. This one-dimensional approach to social status neglects the substantial body of sociological literature indicating that a person's social identity is complex and informed by multiple ascribed (e.g. race/ethnicity, gender) and attained (e.g. income, education) social statuses [240, 241]. Whilst social disadvantaged statuses often do cluster [215, 242], by no means does low status on one dimension necessarily imply low status according all other aspects of social identity.

Furthermore, the relative inequality explanation adopts a very narrow conceptualisation of psychosocial stress. The argument that health inequalities are primarily due to psychosocial stress derived from the perception of lower social status, fails to consider a significant body of work evidencing the many ways that low SES and other disadvantaged social statuses put people at risk of psychosocial stress, including stressful life events and chronic stress exposure from sources other than relative inequality [243, 244]. Notably, Pearlin [245] argues that SES is fundamental in determining exposure to stress continuously throughout the life course with proliferating effects. Thus, whilst psychosocial stress derived from subordinate feelings due to relative inequality may contribute to a social gradient in health, it does not necessarily represent the dominant source of psychosocial stress contributing to social gradients in health.

Relative social positions may also have different implications depending on the social context and the resources that people have available to them. For example, the findings of physiological gradients according to social status in primates cannot readily be applied to human populations because human societies are more far more complex [246]. Even within animals, hierarchies are not always constructed such that low social position necessarily constitutes greater stress [236]. This thus suggests that there is nothing intrinsically stressful about social position, but the implications of low status depends on contextual factors [246]. Contextual factors that may determine the impact of perceived low status and psychosocial stress might be the availability of social resources incurred from other social statuses. For example, a large cross-sectional study of working-aged adults showed that occupational status

modified associations with health such that high perceived stress was associated with better cardiovascular outcomes among those with higher occupational class, but associated with poorer outcomes among those with low social class [247].

Finally, whilst relative inequality may explain why health inequalities persist over time, it cannot account for the fact that chronic diseases have only relatively recently become distributed according to disadvantaged social statuses, from previously being considered diseases of affluence [210]. Arguably, if relative inequality is fundamental to health inequalities, there is no obvious reason why perceptions of low status have not consistently had the same effect on the stress process and chronic disease outcomes across time [248].

#### 1.4.1.3 The fundamental social cause theory

The “Fundamental Social Cause” (FSC) theory offers an alternative framework for understanding health inequalities which addresses many of the limitations outlined above [17, 18]. The FSC theory builds on the sociological concept of social stratification; the process whereby societal structures produce an unequal distribution of access to rewards and resources in the population [249]. The FSC theory contends that resources such as power, knowledge, social contacts, money, and prestige are fundamental to the social distribution of health because they determine the ability to influence health. As such, the FSC theory conceptualises the availability of resources as upstream risk factors of health, exerting influence on downstream risk factors (e.g. health-behaviours, psychosocial stress, healthcare) [17, 250]. Thus, the theory postulates that the ability to avoid, control and treat disease using health enhancing resources is fundamental to inequalities in health, where resources represent the “risks of the risks“[18].

Accordingly, health inequalities arise due to the systematic distribution of resources by social statuses. People who enjoy greater social privileges gain health advantages by employing resources in order to either avoid exposures that are harmful to health, or to facilitate the access, uptake and maintenance of effective treatments [18]. It thus follows that low status groups are more strongly associated with more preventable or treatable illnesses, because high status

groups are better able to avoid health risks and benefit from treatments [251]. As such, the FSC theory provides an explanation for why chronic disease gradients have emerged relatively recently. Phelan and Link [251] argue that advancements to the understanding of chronic disease risk factors (e.g. poor diet, physical inactivity) makes them increasingly more possible to influence through health behaviours and treatments. Thus, health gradients emerge because flexible resources allow high status groups to avoid the important health risks as these are discovered, and facilitate access to effective treatments when these become available.

In the case of mental illnesses, which are less "controllable", resources are likely to fundamentally influence mental health gradients by allowing high status groups to avoid or minimise the impact of psychosocial stress, which represents the most important down-stream risk factor of mental illness [248, 252]. This may involve avoiding debt in times of financial strain, enjoying more secure employment conditions, or avoid living in unsafe neighbourhoods. However, if the "controllability" of mental illness was to suddenly increase, for example by the discovery of an effective genetic treatment, then inequalities in mental illness would increase accordingly [248].

The FSC theory has been supported by evidence indicating that mortality inequalities by SES and ethnicity are greater for conditions that are more amenable to treatment and prevention [253, 254]. These findings also demonstrate how the FSC theory provides an answer to one of the most pertinent paradoxes in the field, namely why health inequalities persist despite continuous advancements in healthcare [210].

#### 1.4.1.4 According to the FSC theory, health inequalities will persist as long as societal inequalities and processes of social stratification continue to generate unequal distributions of health enhancing resources. However, changing social inequalities is challenging and requires intervention at multiple societal levels, including involvement from policy. In contrast, inequities in services are more readily influenced but are nevertheless relevant to address given that they have the potential to reinforce and possibly increase existing inequalities in health. Intersectional theory

An important limitation with both the relative inequality theory and the FSC theory is that they separately consider the effects of single statuses, without considering the health impact of occupying multiple social statuses. As mentioned above, social statuses do not exist in isolation; instead people simultaneously hold multiple social statuses, according to which health resources and exposures are distributed systematically [255]. According to intersectional theory, social statuses do not independently influence health but create dynamic processes where resources and adversities combine to affect health interdependently [255, 256]. For example, the exposure to stressors and the availability of resources varies over the life-course, and so age may modify the impact of stressors associated with other vulnerable statuses [257].

Ethnicity and migrant status in combination with other statuses (e.g. age, gender) represent important intersections of social statuses, which are often overlooked in health inequality research [258, 259]. For example, migrants constitute a social group that is highly heterogeneous with respect to SES and ethnicity, especially in urban settings like London [258]. SES and ethnicity are associated with exposures and resources, separate from those of migrant status, and thus have important implications for comprehensively understanding associations between migrant status and mental and physical health [258]. Conversely, associations between ethnicity and health outcomes may be contingent on migration status. For example, a national community survey of ethnic minorities found that whilst South Asian women in the UK overall had a lower prevalence of CMD compared to White UK women, South Asian women

of younger age and of second-generation migration status are more likely to have CMDs [260]. Therefore, considering multiple social statuses simultaneously using an intersectional approach is critical for comprehensively understanding health inequalities.

#### 1.4.1.5 A health inequalities approach applied to comorbidity

In this thesis I take a broad social epidemiological approach to understanding comorbidity. I use a theoretical framework informed by the FSC theory complemented by an intersectional understanding of social statuses. This approach contends that comorbidity is driven by social circumstances, which are shaped by processes of social stratification that disproportionately distribute health-enhancing resources to the disadvantage of socially vulnerable groups. The intersectional theory contributes an understanding of social statuses that considers the impact of co-occurring statuses in terms of cumulative disadvantage, or by advantaged statuses acting protectively in the context of social disadvantage by other statuses.

A theoretical model of how comorbidity is rooted in social disadvantage is presented in Figure 1. Adverse experiences and resources arising from social statuses (upstream risk factors) are hypothesised to directly affect mental and physical health through down-stream risk factors (e.g. health behaviours, psychosocial stress, healthcare use; not presented). Adversity and resources may also facilitate morbidity-driven mechanisms, such that comorbidity becomes more likely in the context of a non-comorbid mental or physical health condition.

The model further illustrates how comorbidity leads to compromised social functioning, poor clinical outcomes and lower quality of life. This burden of comorbidity may in turn exacerbate adverse social conditions and deplete resources. These implications may also have a negative impact on attained social statuses (e.g. employment, income), thus affecting the availability of resources and experiences of adversity. As such, the model incorporates theoretical components of health inequality outlined by the FSC, with additional reinforcing factors of social selection that contribute to the perpetuation of comorbidity.

As a result of poor clinical outcomes, restricted functioning and limited availability of resources comorbidity places a greater burden on services. However, if effective, services may improve the outcomes of comorbidity and/or social conditions, and ultimately allow patients to transition from comorbidity to non-comorbidity. Thus, the model identifies potential paths to target for intervention.

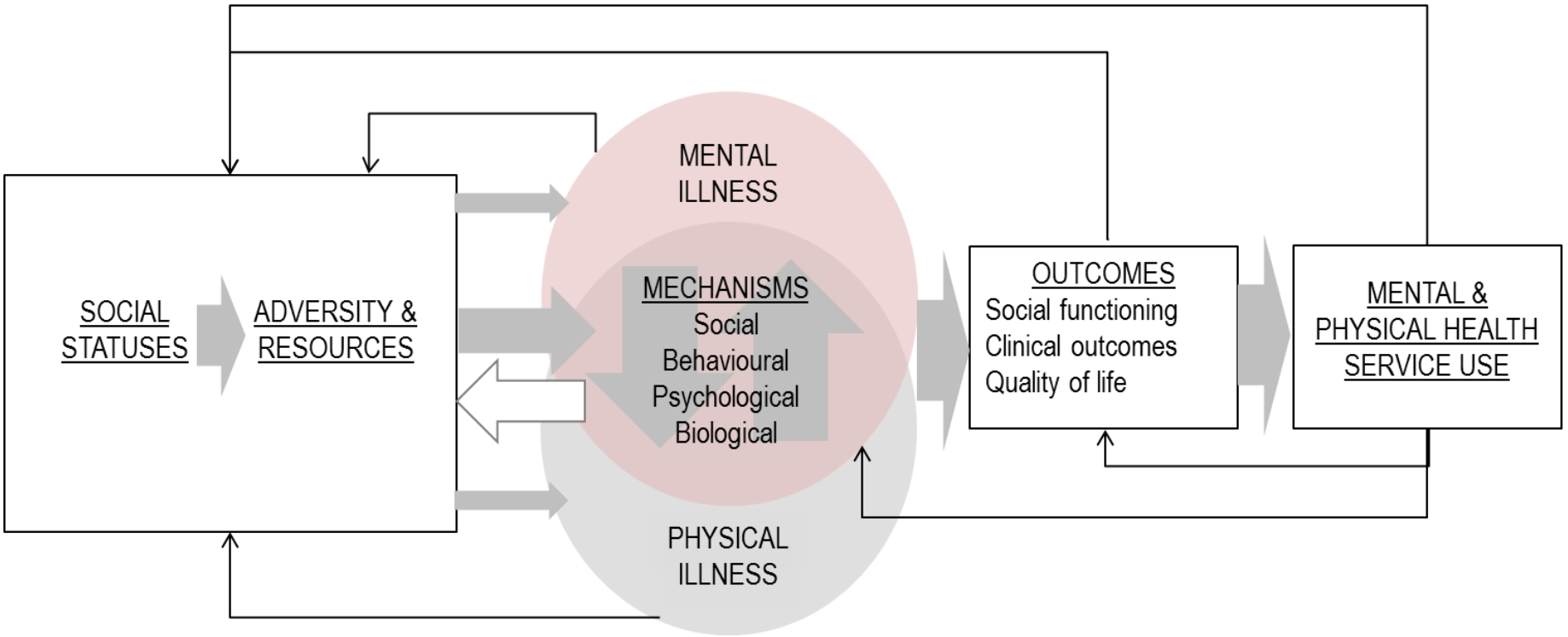



Figure 1 Theoretical model of mental-physical comorbidity

### 1.4.2 Social statuses and associated adversity and resources

The sections below outline theoretical and empirical research indicating how various social statuses entail adversity and resources, and may thus affect mental and physical health.

#### 1.4.2.1 Gender

“Gender” refers to a social construct that incorporates cultural norms and roles that are attributed to men and women, while “sex” refers to a biological construct [261]. Both the biological predisposition of sex and the social organisation of gender have implications for health [262]. Given the social epidemiological approach that is applied throughout this thesis the term “gender” will be used to differentiate men from women. This signifies a particular interest in differences arising from the social circumstances associated with occupying gender roles, without necessarily dismissing the influence of biological predispositions.

Society is broadly structured such that men experience greater power and social privileges than women [263]. According to the fundamental social cause theory, it should thus follow that female gender constitutes a vulnerable social status which is associated with poorer health. However, gender distributions of health are complex, and gender cannot be conceptualised as a fundamental social cause in a straightforward way that SES and ethnicity can [264]. For example, although women live longer they experience poorer physical health [264]. With respect to mental health, CMDs are more prevalent among women [51, 265–267], while substance use disorders are more common among men [266, 267]. In contrast, there are few gender differences in SMIs or psychotic symptoms [72, 266–268]. This may partially be explained by biological predispositions as well as the social organisation of gender roles such that men and women experience different health disadvantages for different outcomes.

An intersectional approach is crucial to understanding health distributions by gender. For example, middle-aged working mothers have been found to experience greater psychosocial stress due to conflicting role demands between work and home [269]. Female gender can also be associated with disempowerment and discrimination, especially when considered in combination with ethnic minority status and low SES [270]. On the other hand,

women often have greater social support networks, which tend to be beneficial for mental as well as physical health [271]. Furthermore, while men tend to have higher income, which is beneficial for health [272], unemployment often takes a greater toll on men's health [273].

#### 1.4.2.2 Age

The risk of onset for the most prevalent and burdensome chronic physical diseases (e.g. type II diabetes, cardiovascular disease, hypertension) increases sharply in later midlife, and continues to increase with age [274–276]. This age distribution may reflect an accumulation of risks throughout life [277].

In contrast to chronic physical illnesses, the risk of first onset of CMDs and SMIs is highest in younger adulthood [278, 279]. Mental illnesses may be chronic and remain burdensome throughout life, and are typically characterised by trajectories of recovery and remission [280, 281]. As people go through life experiencing socio-economic adversity and other stressors, people may relapse into mental illness or develop comorbid psychiatric conditions throughout different stages in life [282]. In general, sparse socio-economic resources and uncertain life prospects in young adulthood are associated with psychosocial stress, which increase the risk of mental illness in this age group [283]. Later mid-life represents the best time for mental health when socio-economic and other social conditions tend to be more stable [283]. In older age, accumulated life experience in terms of knowledge, problem solving and communication may represent a resource that is beneficial for health [257]. However, older age is also associated with financial hardship and social isolation, which may be detrimental to health [283]. Furthermore, the increasing burden of physical illness and impairment in older age may adversely affect mental health [257].

#### 1.4.2.3 Relationship status

Marriage (and cohabitating with a partner) presents two important resources that benefit mental and physical health: social support and higher household income [283, 284]. As well as presenting direct advantages to health, these resources may also buffer the effects of stressors arising from other vulnerable statuses [285]. Whilst single relationship status represents the lack of these benefits, divorced, separated or widowed relationship statuses imply the loss of

such resources, thus also representing the experience of adversity and a stressful life event.

#### 1.4.2.4 Ethnicity

Racial and ethnic inequalities in health have extensively been studied within the U.S., and have increasingly received attention in UK and European literature, indicating that mental and physical health inequalities are persistent and pervasive [51, 213, 214, 286, 287]. A commonly considered explanation of the association between ethnic minority status and health is that they are confounded by socio-economic inequalities, driving the observed differences by ethnicity [288, 289]. However, evidence shows that even after accounting for SES, ethnic differences remain [290, 291]. Genetic, behavioural and cultural explanations have been proposed to account for such differences, but psychosocial stress offers one of the best explanatory models [291]. These include perceived and anticipated discrimination as sources of psychosocial stress [292, 293] as well as structural discrimination restricting educational, employment and housing and opportunities [214, 294]. Structural discrimination may affect mental health through preventing disadvantaged minorities from achieving their aspirations, thus giving rise to goal-striving stress which has been found to adversely affect mental health [295]. Given that ethnic inequalities are based on characteristics which are inherent to a person's identity (ascribed as opposed to attained status), they are more likely to persist throughout the life-course and may thus be particularly deleterious to health [245].

#### 1.4.2.5 Migration

The observation that the health of migrants is often better than the health of the non-migrant population led to the formulation of the "healthy migrant hypothesis", however, inconsistent findings challenge this notion [259]. Examining migrants' health by length of residence in the host country suggests migrants' initial health advantage deteriorates with longer residence over an individual life-course and over generations, and eventually have poorer health [296–298]. Increased exposures to the host's culture (acculturation), or alternatively increased exposures stressors associated with minority status, have been proposed as potential explanations for this deterioration in migrants'

health [259]. Aside from the psychosocial stressors associated with ethnic minority status, there are migrant-specific stressors that may place a burden on migrants. These may include the incongruence between pre-migration expectations of employment and socio-economic mobility, adverse lived experiences upon arrival, as well as downward social mobility as a consequence of migration [299–301].

#### 1.4.2.6 Socio-economic status

The flexible resources that have been most heavily emphasised by the FSC theory are those that are disproportionately distributed in the population as a result of socio-economic stratification processes (power, knowledge, social contacts, money, and prestige). These resources are highly relevant to health inequalities as they are hypothesised to fundamentally influence health by affecting a wide range of downstream risk factors.

SES is a multifaceted concept, where different socio-economic indicators represents different resources and exposures which may differentially influence health [302]. Examining multiple SES indicators therefore best captures socio-economic health inequalities. The conventional markers of SES used in health inequality research include education, social class/occupation/employment and income. However, there are additional indicators of SES which may benefit from being examined in relation to health such as financial strain and benefits receipt.

##### 1.4.2.6.1 Education

Education is arguably the most fundamental of SES indicators, as it is established in early in life and contributes to future trajectories of occupation and income. Thus, the benefits of education accumulate throughout the life course [241]. Aside from determining future SES, education is important for health as it represents knowledge and skills that allow higher educated to make better use of health information, access health enhancing resources and engage in health enhancing behaviours [216, 289]. With higher education, psychosocial aspects with health promoting qualities also improve, such as autonomy, mastery, and healthy social relationships [284]. Particularly when

financial resources are sparse, these psychosocial resources enable persons of higher education to make the most of them [284]. This demonstrates the importance of considering multiple measures of SES.

Education is often a preferred measure in health inequality research because it usually remains stable across the life course after early adulthood [289, 303]. It is also a popular measure in cross-cultural research as the number of years spent in education bears similar implications across countries, whereas social class and income may be more sensitive to cultural and macro-economic contexts.

#### 1.4.2.6.2 Social class, occupation and employment

Social class is the most extensively studied type of socio-economic stratification structure with respect to health, especially in the UK. Social classes are social groups that are defined by economic relationships in society [261]. There are various approaches to conceptualising and measuring social class [304]. In the UK, concepts of social class are rooted in sociological theory and intimately tied to employment relationships [305]. The Registrar General's Social Class scheme, introduced in 1913 (renamed "Social Class based on Occupation" in 1990), has had substantial influence on policy and research [305]. It classifies social class into six groups: (I) professional occupations, (II) managerial and technical occupations, (IIIN) skilled non-manual occupations, (IIIM) skilled manual occupations, (IV) partly-skilled occupations, and (V) unskilled occupations [306]. Goldthorpe and his collaborators developed these categorisations by embedding the conceptualisation of social class within sociological employment relations proclaimed by Marx and Weber [305]. Goldthorpe defined seven categories, distinguishing between employers and employees, and based classifications of employees on "skill" levels and "service" relationships [307].

Whilst the social class conceptualisations put forward by the Registrar General's Social Class scheme and Goldthorpe remain influential, alternative classifications have recently been proposed, partially seeking update the social classes to reflect current labour and economic conditions [305, 308]. Criticism has also been directed toward the exclusive focus on employment relations,

thus neglecting other resources that contribute to common understandings of social class, such as cultural and social capital [308].

Another limitation with the traditional social class measures is that occupation can only be inferred from employment. Therefore they do not adequately capture the SES of persons who are out of employment. These include a broad range of groups including students, retired people, carers, those not in employment for health reasons as well as those who are unemployed. Whilst previous occupation or the occupations of parents or spouses may be used as proxies, these do not necessarily capture and individual's current socio-economic circumstances that inform status.

In the UK, health inequalities by social class have most extensively been explored within the Whitehall studies, demonstrating clear gradients in mental and physical health according to social class [16, 309–311]. As described in previous sections (1.4.1.1), psychosocial stress due to low perceived social status in a hierarchical social structure has been one of the proposed mechanisms driving this gradient [312, 313]. Furthermore, higher occupational status is often associated with better physical and psychosocial working conditions and greater occupational prestige and societal status, which are beneficial for mental and physical health [314, 315]. Moreover, occupational roles associated with higher social class also benefit from performing work that involve a high degree of autonomy and job control, which have important implications for health [316, 317].

Beyond occupation, employment itself is beneficial for health, while worklessness and unemployment have detrimental effects on health [318]. Employment also has social benefits, contributing to individuals' identity and social connections, including connecting people to social institutions [319–321]. The loss of these indirect functions of employment has been found to have negative consequences for mental health in particular [322]. Employment has the added benefit of being an important determinant of higher earnings, as it is the main source by which income is gained [289].

#### 1.4.2.6.3 Income

Income primarily represents the availability of material resources. Access to healthcare resources constitutes an important health benefit of income in private health care settings. However, higher earnings are also beneficial to health in universal healthcare settings [323]. Specifically, higher income may promote positive health behaviours such as diet and exercise [289]. Higher earnings also enables residence in more affluent neighbourhoods which can have positive influences on health, in terms of housing quality, lower crime, transport, health services, pollution, noise, social capital, and opportunities for employment and recreation [324]. Although much remains to be explored about context and health, research indicates a greater clustering of health problems in more deprived neighbourhoods [126, 325]. Furthermore, in line with the relative inequality argument, relative differences in income may affect health, due to psychosocial stress and low perceived status among those with lower income [239].

Lower levels of income can also lead to financial strain, which has been found to be associated with significant psychosocial stress [326]. While financial strain may be inferred from lower levels of income, it is important to also explicitly measure financial strain. For example, certain people may manage well at low income levels if there are few demands on the financial resources (e.g. no dependants). Conversely, if demands are high, financial strain may have significant health effects also at higher income levels [284]. Studies examining debt or self-reported financial struggles have both been shown to have negative implications on mental health, and recent research also shows that it affects physical health [327, 328].

#### 1.4.2.6.4 Benefits receipt

Benefits receipt is a marker of SES that has been studied less extensively in relation to health inequality research, but has been found to be associated with both poorer mental and physical health [273, 329]. Benefit recipients represent a particularly socially and economically vulnerable group of people. Benefit recipients predominantly consist of persons who are unemployed or economically inactive due to health reasons, although welfare benefits are also available to employed people with low incomes (e.g. working tax credit, housing

benefit) in the UK [330]. Whilst the receipt of benefits theoretically has the potential to buffer the stress of financial strain, studies have shown that means-tested benefits have no such effect on mental health [331]. Other evidence suggests that the association between poor mental health and the receipt of means-tested benefits may be driven by adversity from chronic social and material deprivation [273].

### 1.4.3 Empirical work documenting the socio-demographic and socio-economic characteristics associated with comorbidity

Evidence suggests that comorbidity is generally higher among women [39, 332, 333], possibly due to CMDs being more common. However, limited research seeks to map the socio-demographic and socio-economic distribution of mental-physical comorbidity in population samples. In the most extensive research project on mental-physical comorbidity to date, Von Korff [1] and colleagues have made important contributions to the literature with the WHO World Mental Health Surveys. This research indicated that risk of comorbidity increases with age, peaking in later middle age, but remaining high in old age [1, 24]. However, the research output from this survey is limited from a social epidemiological perspective as it has not used this extensive data in order to examine inequalities either by ethnicity or SES. Instead measures such as employment and education have been used as confounders [1, 44].

One of the few studies examining comorbidity by ethnicity in a large representative population sample in New Zealand found that, despite distinct variations in mental and physical health by ethnicity, there were no substantial differences in the associations between CMDs and various chronic physical conditions [334]. There are, however, comorbidity studies that examine ethnicity and other statuses within disease groups. For examples a US population study found that among those in the lowest income group with asthma, Hispanics reported greater mental health problems than non-Hispanic Whites, while non-Hispanic Blacks reported fewer mental health problems than the non-Hispanic Whites. No research to my awareness has examined mental-physical comorbidity by migrant status in a general population sample.

A number of studies have examined comorbidity and its association with SES. Examples of studies adopting a broader social epidemiological understanding of comorbidity include a couple of recent UK studies examining the effects of psychosocial distress and low occupational status on all-cause mortality and mortality from cardiovascular disease [335, 336]. These studies made use of national datasets from the general population. The results indicated that psychosocial distress had more harmful physical health consequences for those of lower social class (measured in terms of occupation) [335, 336]. In contrast to these studies examining individual level SES, a study using a large representative sample of Swedish primary care patients found that the association between depression and diabetes did not vary according to neighbourhood deprivation [337], while primary care studies in Scotland indicate that mental-physical comorbidity is more common in deprived areas [338, 339].

Using the Whitehall II data of the cohort of civil servants, Sacker et al. [34] examined the impact of occupational status on mental and physical comorbidity trajectories over time. They found that recovery from poor mental health in response to adverse physical health events was more difficult among low employment grades, and conversely that recovering from decrements in physical health due to poor mental health was more challenging in low as opposed to high employment grades. The approach of examining trajectories of comorbidity in the context the life-course constitutes an important strength of this study.

## 1.5 Comorbidity and Service use

The increased burden placed on services as a result of mental-physical comorbidity has been cited as one of the most important implications of comorbidity, and has been argued to be among the greatest challenges facing services today [13]. At a population level, CMD-physical comorbidity is of particular relevance given the high prevalence of CMDs. Depression has been found to be the most important contributor to increasing health-costs among comorbidity combinations of chronic illnesses [23, 340, 341], and cost increases have been found to be primarily attributable to increased uptake of health services [342, 343]. Thus, understanding driving forces between the

amplified utilisation of services could be crucial to understanding how to make services more efficient and effective.

Research relevant to health inequalities reviewed in the previous sections suggests that taking an intersectional approach to understanding associations between comorbidity, health inequalities, and service use may be important. According to the FSC theory, health services constitute a resource that controls disease, which social groups differentially access, use and benefit from. The fact that inequalities are greater in diseases that are more amenable to treatment or prevention [251, 254], and that health inequalities are greater according to indicators of severity (e.g. mortality, or disability), rather than incidence [344], indicates that services have an important role to play in health inequalities. Thus, while service use is unlikely to be a fundamental social cause of inequalities in health, services have the potential to influence health outcomes and thus offer an opportunity to reduce health inequalities. Indeed, a key aim of UK health services according to the Department of Health is to "improve equality in health and social care with a focus on improving health outcomes" [345].

### 1.5.1 Domains of service use

Broadly, service use consists of three domains: access, utilisation and quality [346]. Access is "potential use" or "opportunity for use", and includes concepts such as availability of services, and sufficient individual resources to make use of these services. Utilisation is the actual use of health services. Donabedian [347] described utilisation as the evidence of access, thus they are conceptually associated, but nevertheless distinct. Most people may have access to services, while only those who need services use them. Further, among those using services experiences may differ systematically in terms of treatment, referrals and patient-doctor interactions, which could have implications for health. This is why quality is an additionally important domain to consider in equity evaluations of service use.

Access is a relatively abstract concept, and finding a valid measure of access has proved challenging. Most epidemiological research has therefore used measures of utilisation. Some treat utilisation as an indicator of access, however, given that access is necessary, but not sufficient for utilisation to take

place and that utilisation is also determined by other factors, differences in utilisation may or may not reflect differences in access. Thus, utilisation is better thought of as a conceptual unit in itself, with its own determinants, rather than a proxy of access.

### 1.5.2 Theoretical approaches to service use

#### 1.5.2.1 Andersen's model

The most widely applied conceptualisation of service use is Andersen's behavioural model of healthcare access [348–350]. It defines access as utilisation and anything that may impede or facilitate it, including various components of need [350]. The model distinguishes between "need", "predisposing" and "enabling" factors. Predisposing characteristics are characteristics that predispose individuals to use services either because they are associated with elevated need (e.g. old age) or because they provide an indication of the status of the individual (e.g. education, ethnicity) and their consequently their ability to draw on resources to cope with problems [349]. Enabling factors are those that impede or facilitate service use, while "needs" are direct indicators of health. The behavioural model further distinguishes between "realised" and "potential" access. The enabling factors constitute potential access, and as enabling factors increase, so does the likelihood that service utilisation – or realised access – will take place. These have remained as core components of the model as it has been regularly revised since its first conceptualisation in the 1960's.

According to the most recent version of the model, predisposing, enabling and need factors contain both individual level, as well as contextual components [350]. Individual level examples of "need" include perceived and evaluated measures of health; "predisposing" factors may include age, education, attitudes to healthcare, while "enabling" factors include income (especially in private health insurance settings) and social support. At the contextual level, need factors may include environmental health indicators (occupational, traffic or crime-related injury or mortality) and population health measures (e.g. morbidity, mortality). Contextual predisposing factors are demographic compositions at the community level (e.g. level of deprivation according to census areas), as well as cultural norms regarding healthcare and help-seeking

behaviour. The contextual enabling characteristics outlined by Andersen place emphasis on provider aspects such as healthcare policies (e.g. healthcare coverage), healthcare financing and provisions of healthcare facilities [351, 352]. However, contextual factors may also influence service access and utilisation in other ways. For example, deprived areas have fewer resources to maintain social organisations, which provide opportunities to exchange healthcare information. Access may also be restricted in terms of supply of services in deprived neighbourhoods, as they might be considered less attractive to healthcare professionals [353].

An important strength of the model is its comprehensive inclusion of a wide range of individual and contextual components that influence utilisation services, including biological and social components of need, population and provider level characteristics. Specifically, the behavioural model allows for incorporating “need” components, as well as considering “predisposing” factors. This is particularly important, given that both the need for services and service uptake is associated with both socio-demographic and socio-economic indicators, as well as other service use correlates. Thus, in order to adequately understand how determinants of service use impact on service uptake it is important to isolate the effect of need. For example, women tend to use services more, but are also more likely to have CMDs, so in order to understand to what extent female gender contributes to service use behaviour, psychiatric morbidity needs to be taken into account.

A limitation with this approach is the linear and categorical approach that is applied to the predisposing, enabling and need factors. For example, psychiatric morbidity can affect the availability of enabling resources, such as social support. Furthermore, certain factors that are considered predisposing, may be better conceptualised as enabling factors. For example, education has mostly been conceptualised as a predisposing characteristic determining need and enabling resources, but it may also constitute a resource, which could act as an enabling factor in its own right (e.g. health literacy). The lack of clarity of the model regarding what constitutes predisposing and enabling factors, becomes evident in reviews of the behavioural model where predisposing and enabling variables are inconsistently applied [354].

#### 1.5.2.2 Network-Episode Model (NEM) of service use

Further limitations with the behavioural model include the conceptualisation of service use as a dichotomous outcome, and the implicit assumption that service utilisation is the outcome of a rational response to the existence and recognition of need for services. This understanding of service use is one which has its roots in Parson's classic model of illness, where persons rationally evaluate their symptoms and adopt a sick role which involves the obligation of seeking professional help [355]. However, service use is unlikely to be the outcome of a simple response to symptoms, especially in the case of mental health. Instead MHSU is more likely to represent the outcome of an intricate behavioural process which spans over time, with causes that do not simply involve the identification of symptoms, but also influences from other people and circumstances. Whilst Anderson does acknowledge this in the model and allows for the incorporation of multiple determinants, such as social support and stigma, treating use as binary use or no use does not capture how or why people end up using services, why some never use them, or why some drop out of services before they have an opportunity to benefit from the treatments that are offered.

The Network-Episode Model offers an important perspective of service use which addresses these limitations, placing special emphasis on the role of social networks [100, 356]. NEM proposes that the events of entering and exiting services are part of dynamic processes which are embedded within immediate social networks and wider treatment networks [100]. NEM takes the perspective that these processes take place throughout time, which allows for consideration of previous experiences, both on behalf of the individual and of persons in the social network [100].

This broader perspective that it takes of the process of help-seeking and how this is embedded in a social context constitutes an important strength of NEM, and stands in contrast to Andersen's behavioural model which places emphasis on utilisation of services as an outcome in itself. Arguably the transitions into and out of care and what the determinants of these are, are of great importance.

### 1.5.3 Determinants of service use

Studies typically measure self-reported utilisation for mental health services over a specific period of time (usually the past 12 months), whilst also measuring psychiatric morbidity in the form of psychiatric diagnoses, longstanding emotional problems, structured symptom checks, and/or psychological distress, as well as socio-demographic and socio-economic and psychosocial indicators. Thus, much research draws on Anderson's behavioural model in terms of incorporating need and social characteristics in the statistical models, but many do not make an explicit distinction between predisposing and enabling factors. This approach of examining service utilisation whilst broadly distinguishing between "need" and "non-need" determinants has been coined the population-standard approach by Asada and Kephart [346]. This approach places emphasis on the incorporation of need in order to enable accurate examination of other service use determinants, given that service use is determined both by need and social characteristics, and that social characteristics also determine need. Research using the population-standard approach to research MHSU is reviewed in the sections below.

In contexts where healthcare coverage is predominantly obtained through private insurance (e.g. the USA) access and service utilisation is heavily determined by health insurance. Thus, although a large body of literature exists in relation to MHSU in the U.S., especially with regards to ethnicity and race [357–359] these studies are not generalizable to universal healthcare contexts like the UK. Therefore the empirical literature review will mostly present studies using populations from countries with universal or near-universal healthcare coverage (e.g. the Netherlands, Canada, Australia) in addition to relevant studies from the UK.

#### 1.5.3.1 Need-related determinants of service use

Need for mental health services may be broadly defined as:

"*the agglomerate of those demands of people having a health problem, their families and their communities to which the healthcare system can respond by an effective intervention. In this context, effective interventions are those that have a predictable and significant positive effect on the problem and are*

*acceptable to the individuals who have the problem and those who care for them."* [p. 7, 360]

As suggested by the definition above, need taps into many different dimensions. An important consideration in operationalising measures of need is to capture aspects of both perceived and evaluated need. These respectively refer to subjective judgments of need, and external assessments of morbidity or functioning. Perceived need measures include self-rated health and perceived functioning decrements, while evaluated need indicators include standardised measures of morbidity, diagnoses, and sick days. Indicators of perceived and evaluated mental health need are typically strongly correlated with each other, but they do not always overlap [361]. Thus, studies often include indicators of both perceived and evaluated need in models.

#### 1.5.3.2 Morbidity, clinical severity and functioning

Indicators related to mental illness severity include morbidity, clinical severity and functioning, and these are the most important and consistent determinants of service utilisation [362–366], as well as receipt of anti-depressants and psychotherapy [367, 368]. A U.S. study examining service use across multiple timepoints found that base-line depressive episode was a strong determinant of the continuity of MHSU [369]. Similarly, a prospective study using a Dutch general population sample found that depression at baseline was associated with eight times elevated odds of using services persistently across both measured timepoints, as opposed to not using services at either timepoint [370].

Treatment use also increases with the severity of a disorder [371, 372], consistently across different cultural settings [373], and with increasing numbers of comorbid mental disorders [362, 365, 374, 375]. However, comorbid depression and substance dependence has been associated with less service use, especially primary care [376]. Illustrating the gate-keeping role of primary care services, a large cross-national study of general populations from six European countries (The European Study of Mental Disorders (ESEMeD)) found that 33.4% of service users with a 12-month mental disorder used GPs exclusively, and 28% used GP services in combination with a mental health professional [362]. In contrast, service users without a mental disorder made

greater use of GPs exclusively (38.5%) and were less likely to use GPs in combination with a mental health specialist (15.9%) [362].

Worse self-rated mental health [365, 377], psychological distress [374] and functional impairment [371, 374, 375, 378] are also determinants of service use. Another study using the cross-national ESEMeD data found that disabling mental disorder was an important predictor of service use among those with perceived need, while those with non-disabling mental disorders were no more likely to use services than those without any lifetime mental disorder or subthreshold symptoms [364], suggesting a particularly important role of functioning. However, a cohort study of the Dutch general population distinguishing between service sources found that accompanying functional impairments were only significant indicators of greater service utilisation for exclusive primary care use, but not secondary care [379].

While greater severity and impairment are strong correlates of service use, this does not mean that all who need care are using services. A typical finding in the literature is that only one third of those with evaluated need use services [371, 373, 380, 381]. Whilst this is often taken as evidence that “unmet need” for care is substantial, evidence also suggests that not all with “need” according to normative definitions actually require services to recover, as most with evaluated unmet need remit spontaneously [361].

#### 1.5.3.3 Perceived need

Alongside mental health related indicators of need, perceived need is one of the strongest correlates of service use. This could be argued as reasonable since few would choose to seek help unless they thought they needed them, and compulsory admission is rare. Indeed, lack of problem recognition is an important determinant of delayed help-seeking [382], and some evidence suggests that perceived need is a far more robust predictor of service use than evaluated need measures [383, 384]. For example, a prospective study using a Dutch general population sample examined first-time uptake of mental health services and found that perceived unmet need at baseline was a stronger determinant of incident service use at follow-up, than psychiatric morbidity at baseline [370].

Perceived need may in itself explain why clinical severity indicators are strong predictors of service use, as perceived need is strongly associated with greater functioning impairment and psychiatric comorbidity [385]. Yet, while evaluated need and perceived need are closely associated, not all with mental disorders report perceived need for treatment [386, 387]. This may either be due to resilience, having their needs met from other sources or due to lack of problem recognition. Further, whilst contrasting evaluated need and utilisation suggests that two thirds of those with mental disorders have their needs unmet, estimates of perceived unmet need are considerably lower. For example, a Canadian study found that among adults with 12-month anxiety or affective disorder, 23.4% reported no use of services despite perceived need [388].

The important role that perceive need may have in service use suggests that it may be important to distinguish those with perceived unmet needs from those with evaluated but no perceived needs. A cross-sectional study of Dutch primary care patients adopted this approach to examine the socio-demographic, socio-economic and clinical determinants of service use [375]. They distinguished between 3 groups: 1) those without perceived need, 2) those with perceived unmet need and 3) those who perceived need and used services. The results showed few sociodemographic and socio-economic differences between the groups, but as expected those with more clinically severe CMD symptoms and greater functioning limitations were more likely to report perceived need and treatment use compared to those without perceived need. However, those reporting greater severity were also more likely to report perceived unmet needs compared to without perceived need, and the perceived unmet need group and the service use group did not differ substantially from the service use group according to the clinical indicators. This suggests that it may be problematic to conflate non-service users with and without perceived need.

Given the importance of perceived need in determining care uptake, lack of perceived need among those with evaluated need is sometimes conceptualised as a barrier to care. However, it could also be argued that because those who are most severely affected by mental illness in terms of disability perceive the greatest need, perceived need deserves the attention from service providers, and may be helpful in service planning [385]. Indeed, it may be the case that among those with perceived unmet needs there are particular barriers to care

that need to be attended to, while those with evaluated need without perceived need, have their needs met through the receipt of adequate social support. Thus, the “barrier” of lack of perceived need may actually be an accurate judgement of needs and what services can do for them.

#### 1.5.3.4 Socio-demographic determinants of mental health service utilisation

The literature consistently shows that women use mental health services more than men [362, 363, 372, 377, 389], although some evidence suggests that they are less likely to receive anti-depressants [367]. However, a more recent study in the UK found that women were more likely to receive both antidepressant treatment and psychotherapy [368], and that this association was driven by severity of the mental disorder. In addition to evaluated need, perceived need might account for the difference in service uptake between men and women, as studies have found that there are no gender differences in service use among those who perceive need for care [364], and that the association between female gender and MHSU has been fully attenuated after the inclusion of perceived need [384].

Service use is also greater in middle adulthood, with younger and older adults using services less [363, 364, 372, 389, 390]. Younger and older age is also associated with lower use of antidepressants [367, 368]. Evidence also suggests that older people are more likely to delay treatment seeking [382], and less likely to see their GP for mental health reasons [391]. As with gender, the utilisation distributions by age may similarly be at least partially explained by perceived need, as adults under 24 and older persons report less perceived need [385, 386].

Conflicting evidence has been found with regards to relationship status; several studies find no differences [364, 365, 374, 389], while other studies report greater use among those who are single [362, 372], divorced, separated or widowed [363, 372] and married [377].

Ethnic minority status in the UK is associated with lower mental healthcare utilisation and less antidepressant treatment [367, 391]. Some have found that Black, South Asian as well as Mixed or “other” ethnic groups use less services

compared to those of White ethnicity [372, 392], while other have found that only those belonging to a South Asian ethnic groups use services less, while other groups are no different from the White group [363]. Compared to White British, those of “other” ethnicity were more likely to be in contact with a psychiatrist, but also more likely to have waited longer to see their care co-ordinators, while Asian and Black minority groups were less likely to have received talking therapy [392]. This suggests that ethnic minority groups might have unfair access for specific treatments.

There is also evidence that Black minorities groups in the UK experience more adverse pathways into care for SMI in terms of compulsory admissions. This seems to be particularly true for those of Black Caribbean ethnicity [393, 394]. Suggested reasons for this include lack of perceived need and barriers to care, such as lack of social support to facilitate service use, and stigmatised illness views and previous discriminatory experiences in healthcare. This might delay treatment seeking, leading to greater severity and increased likelihood of compulsory admission [393–395].

The evidence is more inconsistent with regards to migrants. One Dutch study found that migrants with CMDs were less likely to receive treatment, and more likely to report perceived unmet need [375], while an Australian study reported no differences by migrant status [374]. These conflicting findings may depend on the characteristics of the respective migrant populations. For example, a Canadian study found that among migrants, service use was associated with older age for those who were young when they migrated, longer length of stay, greater utilisation of services overall, and higher education [396]. However, a study examining intersections of migrants status by length of residence in the UK, reasons for migration and ethnicity in an urban population found few differences in primary and secondary MHSU between these sub-groups, as well as no differences between overall migrants and non-migrants [258]. An exception to these findings was that migrants of Black African ethnicity were less likely to use secondary mental health services, after adjusting for socio-demographic, socio-economic and health behaviour indicators, although no adjustments were made for need.

A small number studies have examined the association between aggregate socio-demographic characteristics of geographical regions (e.g. census areas)

and MHSU. These have generally found no evidence of associations between aggregate socio-demographic indicators (e.g. percentage of recent immigrants or lone mothers) and service use, or that individual or compositional socio-demographic measures account for any observed associations [377, 397, 398].

#### 1.5.3.5 Socio-economic determinants of mental health utilisation

Originally proposed in 1971, Tudor Hart formalised into a theory the observation that “the availability of good medical care tends to vary inversely with the need for it in the population served” [p. 405, 399]. The inverse care law has mostly been applied to study the geographical variation in supply of general health services or specialist physical healthcare, and has produced mixed evidence. Studies examining aggregate MHSU in the UK have observed found greater utilisation in more deprived areas (reviewed by Goddard and Smith, 2001). However, these studies did not consider mental health service need, which is important given that psychiatric morbidity also varies according to deprivation [400–403]. Similarly, an individual level study of persons with significant psychological distress in the UK study found that those who lived in more deprived areas used more services, although it did not consider other individual level SES indicators [404]. In contrast, multi-level models adjusting for need and other individual-level correlates have found less service uptake in more deprived areas in support of the inverse care law [377, 405], or observed no association [406, 407].

The main ways in which contextual factors associated with social deprivation have been hypothesised to impact of service use include constructs related to social capital [408] and the availability of mental healthcare resources. In support of these proposed explanations residential instability (an indicator of social capital) [377, 398], higher proportions of health practitioners [397], and geographic accessibility to health services [405] have all been found to be associated with mental health service uptake.

Research examining individual level SES using the population standard approach to account for mental health service need has also produced conflicting findings. For example, several studies have found no differences by education [364, 365, 374, 375], income [364, 365, 374, 375, 389] or

employment [375]. Evidence of distributions favouring those who are socio-economically disadvantaged include studies finding that employment is associated with less service use in comparison to other employment categories [371, 374]. Those who are economically inactive due to health and those who report financial strain have also been found to be more likely to use both antidepressants and psychotherapy, compared to those who are employed [368]. Findings from a study of young adults in the Dutch general population further indicates that speciality services (e.g. psychiatrist, psychologist, or psychotherapist in private practices) are more often used by those of lower education and economically inactive employment status, but that these associations were accounted for by evaluated need (measured in terms of disability) [384]. Further, an analysis of national cross-sectional surveys of Dutch households indicated that households reporting low income and dependence on benefits made greater use of mental health services from both specialist services (e.g. psychiatrist) and social services (e.g. counselling) for mental health [409].

In contrast, a cross-sectional study of adults from the general populations of six European countries (ESEMeD) found that those who were in employment used more services than homemakers and retired people (Alonso et al., 2007). Those without educational qualifications have also been found to use less psychotherapy [368]. Furthermore, while evidence from a national study of Dutch households suggests that persons from households reporting lower education use more psychosocial counselling and practical support offered by social workers, they instead use less specialist mental health care, such as psychological therapy and psychiatric treatment [409]. Further evidence from the research using survey samples from the Dutch general population supports this, finding that those of higher education are more likely to receive specialised mental health services [410].

The evidence suggesting favourable distributions towards socio-economically disadvantaged groups could partially be explained by higher SES groups choosing to make use of private mental healthcare. A UK study found that adults of higher household income, education and occupational class were more likely to use private psychotherapy and less likely to use psychotherapy provided by the NHS [411].

#### 1.5.3.6 Social determinants of mental health service utilisation

Much of the literature has been influenced by Andersen's behavioural model and conceptualises social support as an enabling resource that facilitates service use, and some evidence supports this conceptualisation. For example, within a sample of primary care consulters who screened positive for CMDs, those in contact with mental health services reported less social support than those who were not in contact with services but did not perceive a need to see them, but more social support than those not using services with perceived unmet needs [375]. Other supporting evidence includes findings that social support is associated with greater use of primary care services exclusively (not in combination with secondary care services) [398], that emotional support is associated with greater use of primary care use in combination with secondary care use [412], and those reporting the availability of social support when ill were more likely to use mental health services [413]. Furthermore, residential stability has been found to be associated with greater service use among those with evaluated need suggesting that social networks may be an important determinant of service use [377].

However, conflicting evidence also suggests that depleted social support may be associated with mental health services uptake. For example, in a Dutch general population sample, living alone and low levels of social support (according to a composite measure) were associated with greater service use [414]. In the same study, the effect of low social support on service use was amplified among those with mental disorder. Similarly, evidence from a Canadian general population sample indicated that the absence of social support and residential instability increased the odds of using specialist mental health services in isolation (as opposed to using primary care services in isolation) [398].

These contrasting findings suggest that whilst the impact of social support may facilitate service use, the availability of social support may also decrease use of services by buffering the impact of psychological distress and the perceived need to use them. Indeed, evidence suggests that informal mental health care is often used by persons with mental health problems and that they may be used both in combination with services or on their own [381, 404, 415]. Especially in the case of mild disorders, sufficient social support may mean that

services are not necessary as psychiatric severity has been found to be an important determinant of MHSU in combination with informal support, as opposed to using informal support exclusively [381]. Further evidence indicates that informal care has is a more important determinant of formal service use than clinical indicators [384].

Evidence suggests that it may be important to disaggregate the different components of social support to better understand how it affects service uptake. For example, having a confidant and reporting concern shown by others increased compliance of psychological treatments [416]. A study of an urban community population in the UK found that those who reported having someone to talk to was associated with use of informal care for mental health, either in combination with formal service use or in isolation [381]. Furthermore, the probability of using informal care for mental health problems in isolation, possibly as a substitute for services, has been found to increase with increasing sizes of social networks [356].

Using a U.S. sample of depressed elderly adults residing in the community, Gum et al. [369] examined service use measured at multiple timepoints over six months, and illustrated which covariates of service use remained stable over time. Aside from baseline anti-depressant use and depression, the strongest determinants of treatment use in the adjusted model were receipt of advice to seek mental health treatment, and the intention to begin mental health treatment. This illustrates the importance of also considering the content of the social support or advice that is provided, and how this may in turn influence attitudes towards services and uptake.

It may also be important to examine components of social support in combination with each other or with adversity or social statuses. For example, Kleinberg et al. [417] found that emotional loneliness interacted with contact frequency with family such that greater contact with family members among those reporting emotional loneliness increased service use. Similarly, the same study showed that greater contact frequency with family amplified service use among those who were dissatisfied with their couple relationships. Gender differences have also been observed. Mechakra-Tahiri [418] showed that having a confidant, receiving emotional support and receiving instrumental support amplified service use among depressed elderly men, while these

indicators made no difference to service uptake among women, who were more likely to use such services regardless of the availability of social support. Furthermore, a longitudinal study of U.S. community-dwelling adults found that social support following the experience of stressful life events decreased the uptake of both primary and secondary mental health services [419].

#### 1.5.3.1 Summary of the determinants of service use

The most important determinant of service use is need, both evaluated and perceived. Socio-demographic and socio-economic factors show associations with service use, and are intricately related to need-related, social and attitudinal factors which play an important role in determining use of mental health services. However, the socio-demographic, socio-economic, social and attitudinal factors show inconsistent associations with service use across studies, suggesting that the determinants of service use are specific to different healthcare contexts and populations.

### 1.5.4 Empirical evidence examining comorbidity and mental health service use

There are theoretical grounds for hypothesising that comorbidity would be associated with increased use of mental health services, similarly to the physical healthcare literature. Higher symptom severity and greater functioning decrements are common features of mental-physical comorbidity. Given that these are also among the most important determinants of MHSU, they could plausibly contribute to greater service use among those with comorbidities [420]. More regular interactions with healthcare by those with chronic physical health problems could also facilitate use of mental health services. Just the higher frequency of interactions with healthcare could increase the probability of mental health problems being identified. Alternatively, those with chronic physical conditions may feel greater trust towards their health providers as a result of greater continuity of care. They may thus find it easier to disclose problems related to mental health [421].

On the other hand, physical comorbidity may constitute a barrier to mental health services. For example, diagnostic overshadowing may occur at multiple stages of the help-seeking process, whereby symptoms of mental illness are

mistaken for symptoms that are part of the physical conditions. People may be less able to identify such symptoms in themselves, which may influence perceived need, and in turn help-seeking. Also when symptoms are presented to health services, diagnostic overshadowing may occur on behalf of health professionals [158]. Thus, comorbidities may restrict access to effective treatment, even if help-seeking behaviour is unaffected.

There are two broad ways in which MHSU has been researched in the context of physical comorbidity. First, there is research which defines study samples according to mental or physical morbidity, and examines the effect of the comorbid illness on service use within these samples; i.e. testing the effect of physical comorbidity among persons with mental illness, or the effect of mental illness among persons with physical illness, on service use outcomes. The second body of research involves MHSU research in general population samples or primary care samples. These studies often incorporate physical illness into statistical models testing determinants of service use, alongside psychiatric morbidity, either as an independent variable of interest or as a confounder. There are a very limited number of studies from either of these two research designs that explicitly examine mental-physical comorbidity as a "need"-factor of interest in relation to MHSU.

#### 1.5.4.1 Examining mental health service use among persons with chronic physical illness

The first body of literature examining quality or access to care among patients with chronic physical conditions tend to report worse quality of mental health services. A UK study found that among patients who were frequently referred to specialists for medical assessments or procedures, primary care records indicated that only one in five of those with comorbid depression received minimally adequate treatment according to national guidelines [422]. Similarly, a subsample of persons with diabetes from a German population survey found that only seven of 40 respondents with mental disorders attended specialist mental health services [423].

An inherent limitation of these types of study designs is that they provide no non-comorbid mental illness comparison group. Studies that restrict their

samples to persons with mental health problems or use full primary care samples or general population samples overcome this limitation.

#### 1.5.4.2 Examining mental health service use among persons with mental illness

A relatively common approach to understanding determinants of MHSU using general population or primary care samples is to examine correlates of interest in samples defined by mental illness. These studies often include physical illness as a correlate among other health-, or "need"-related correlates, where physical health is either the primary determinant of interest, or treated as a confounder.

Examples of studies with an explicit interest in examining the impact of physical comorbidity within populations defined by mental illness include studies of Dutch primary care patient samples [424, 425]. Nuyen et al. [424] found that among primary care patients recently diagnosed with depression, there were no differences in depression treatment initiation between those with comorbid chronic conditions and those without such conditions. However, examination by specific conditions indicated that those with ischemic heart disease and cardiac arrhythmia were less likely to receive depression treatment initiation. Nuyen et al. [425] found no unadjusted differences in depression diagnosis between those with or without comorbid physical conditions among Dutch primary care patients with depression (ascertained through surveys screens). However, in the fully adjusted model, a significant interaction effect between physical comorbidity and additional psychiatric morbidity (alcohol abuse/dependence, bipolar disorder, or anxiety disorder) was found such that those with both were five times more likely to receive a depression diagnosis, compared to those with neither. In contrast, those reporting physical comorbidity without additional psychiatric morbidity, were at *lower* odds of receiving a depression diagnosis.

In other studies using samples defined by mental illness, physical illness is included as a covariate among many other potential determinants of service use. This research design allows for an indirect understanding of the impact of mental-physical comorbidity on MHSU. Consistent with the research outlined above, some studies indicate no increase in service use associated with

physical illness. For example, a cross-national study of European counties found that the presence of chronic physical conditions made no difference to the utilisation of neither primary nor secondary services for mental health reasons among those who were considered having mental health service “need” [389]. Furthermore, among those who screened positive for an anxiety or affective disorder from a random sample of Dutch primary care patients, physical comorbidity did not affect service use for mental health problems [375].

A study of elderly community residents with depression in Canada suggested that gender modified the association between physical illness and MHSU. Men who reporting two or more chronic physical conditions reported increased service use, while no difference by chronic illness was found among women [418]. With respect to continuity of service use, a cross-national randomised-control trial of psychological interventions among depressed patients from five European countries, found that the presence of a physical illness increased the probability of completing treatment, given that it had been initiated [416]. Increased suffering and availability of time, and more realistic treatment expectations were offered as possible explanations for this finding by the authors.

#### 1.5.4.3 Examining mental health service use in samples non-defined by health, without explicitly testing comorbidity

Studies using general population samples examining the impact of physical illness on MHSU whilst statistically controlling for mental health, tend to indicate that chronic physical illness is associated with greater MHSU. In a study examining determinants of primary care services for mental health reasons in a large British household survey found that after adjusting for psychiatric morbidity there was a near two-fold increase in MHSU among those with chronic physical conditions [363]. Similarly, a study of a community population sample in South Africa found that having tuberculosis resulted in a five-fold increase in the odds of reporting MHSU, after accounting for mental health and other correlates [413]. Using a large community sample representative of the Canadian population (Canadian Community Health Survey Cycle (CCHS) 1.1), Sareen et al. [426] found that after adjusting for depression and other service

use correlates, an independent effect of physical health conditions on MHSU was observed. Compared to those reporting no physician-diagnosed physical conditions, having one physical condition increased the odds of mental health service use by 43% and two or more conditions increased the odds by 84%. In a multi-level model of mental health service utilisation using the second wave of the above described Canadian population survey (CCHS 1.2), the reporting of any chronic physical conditions was associated with a 21% increase in primary care use, and a 34% increase in specialist MHSU after adjusting for socio-demographic, socio-economic and “need”-related factors at the individual and regional level, as well as health system resources [397]. A different study using CCHS 1.2 indicated that those reporting chronic physical conditions were specifically more likely to use primary care services in combination with specialist services for mental health reasons (effect sizes ranging from 2.50-2.94), as opposed to primary care services alone (effect size of 1.54) or specialist services alone (associations were non-significant), suggesting an amplified burden placed on services by those reporting physical comorbidities [412]. However, among a CCHS 1.1 subsample consisting of those aged over 55, there were no differences in MHSU by physical comorbidity among those with depression or anxiety disorders [365], suggesting that amplifying effect of comorbidity on MHSU may be specific to the younger and middle-aged adult population.

However, given that physical illness is often not explicitly the determinant of interest in these types of studies, it is included in models with an inconsistent selection of other variables, which could plausibly explain the inconsistent results with regards to physical comorbidity. Furthermore, the variations in mental illnesses, study populations and service use contexts examined are also likely to contribute to the inconsistent findings in the literature. These studies are also limited by the fact that they do not allow for comparisons to a non-comorbid mental illness group, and therefore provide no insight into the factors underlying the association between comorbidity and MHSU.

One of the few longitudinal studies examining patterns of MHSU and incorporating physical illness found that somatic illness was associated with incident service use both before and after adjusting for other correlates

(including mental health), but that the unadjusted association with continued service use was no longer significant after making these adjustments [370].

#### 1.5.4.4 Explicitly examining the impact of comorbidity mental health service use in samples non-defined by health

A limited number of studies have explicitly tested the impact of comorbidity on MHSU in comparison to a non-comorbid mental illness group in representative population samples or in primary care patient populations. Most suggest that physical comorbidity is associated with elevated MHSU, although there have also been some conflicting results.

Research from the Global Mental Health Surveys found that depression and two or more comorbid physical conditions was associated with 40% increased odds of MHSU in high-income countries, after adjusting for age, gender, education and chronic pain conditions [427]. Comorbid depression and chronic pain conditions did not demonstrate any effect on service use. However, the adjustment for other somatic conditions may have accounted for this non-finding, as unadjusted prevalence distributions did indicate that service use increased according to the number of pain conditions reported.

A study of the New Zealand population found that service use was facilitated by the presence of chronic physical illness, particularly pain conditions (e.g. (arthritis, back or neck pain, headaches) [421]. This study also examined the effect of physical comorbidity on mental health service among ethnic groups, indicating that physical conditions among those with above threshold mental illness symptoms were associated with substantially elevated odds of service use within the Pacific ethnic minority group, while there was no difference among those of Maori ethnic minority status or those reporting “other” ethnicity.

Goodwin et al. [420] explicitly examined the impact of comorbid asthma and mental disorders on MHSU in a Canadian community sample. Compared to those with non-comorbid mental disorders, comorbid asthma was associated with increased use of both secondary mental health services as well as anti-anxiety medication, after adjusting for socio-demographic and socio-economic correlates. However, after adjustments were made for other chronic physical conditions, the associations were fully attenuated. This suggests that the added

burden of multiple conditions was responsible for the increased use of mental health services and not asthma specifically, consistent with the generalist comorbidity perspective.

Using a Dutch general population sample, Van der Feltz-Cornelis et al. [428] illustrated that the association between mental-physical comorbidity and MHSU may vary according to the types of mental disorders and services. Their study showed that anxiety and physical comorbidity increased the use of both primary and secondary mental health services , while comorbid substance use and physical illness was associated with greater use of secondary care only, and physical comorbidity had no effect on either type of service use among those with mood disorders.

Certain studies have specifically focused on symptoms of pain and how they impact on help-seeking. In a general population sample of community dwelling adults from six European countries (ESEMeD), depression and comorbid pain was associated with lower uptake of service use and significant delay in help-seeking [429]. This contrasted the findings from another study focusing on a subsample of elderly persons in the ESEMeD study, where comorbid pain and depression increased service use [430]. The authors suggested that these contrasting findings may be explained by the fact that pain among the elderly is often accompanied by chronic physical conditions, whereas somatisation is more likely explanation of pain among younger adults. This interpretation is supported by a U.S. community study indicating that somatic symptoms generally, and not medically unexplained specifically, were associated with three-fold increased odds of MHSU in a fully adjusted model, also including chronic physical conditions which were associated with a two-fold increase [431]. Those reporting medically unexplained symptoms were, in contrast at lower odds of reporting service use, although the association was not statistically significant. However, the model did not adjust for psychiatric morbidity.

In contrast to depression, results from the ESEMeD study indicated that anxiety and comorbid pain were associated with greater service use, but that those reporting comorbid pain also delayed service uptake longer compared to those who reported non-comorbid anxiety, similar to the findings examining comorbid pain and depression [432]. Thus, the elevated service use which is commonly

reported among those with comorbidities might reflect quantity of use rather than incidence, plausibly due to diagnostic overshadowing leading to delayed help-seeking and more severe mental illness symptoms at presentation to services.

A recent U.S. study took a novel approach to examining comorbidity in relation to mental health service utilisation by focusing on the role of adverse physical health events in relation to utilisation [433]. The study prospectively examined the effect of adverse physical health events on mental health service use and found that this increased MHSU, and that the association was strengthened with increasing perceived severity of the event. The authors concluded that this was in part accounted for by the worsening of mental health and not simply due to facilitating identification.

In contrast to these previously described studies broadly suggesting increased MHSU among those with comorbid physical conditions, a large cross-sectional study examining MHSU in the past 14 days in a Spanish general population sample concluded that physical comorbidity constituted a barrier to accessing services in a fully adjusted model (including mental disorder), although the unadjusted association indicated a two-fold increase of MHSU among those with chronic illness [434]. However, when examining a subsample of those who reported chronic mental health problems the two-fold increase in odds of service use persisted for those reporting physical health conditions after adjusting for correlates.

No research has explicitly examined the impact of mental-physical comorbidity on patterns of MHSU over time. Thus, the studies based on the overall prevalence of service utilisation cannot distinguish whether comorbidity associations are driven by incident use or continuous use, which could potentially be an important distinction to make.

## 1.6 Synthesis, aims and hypotheses

This chapter has provided an overview of how social circumstances and resources influence health, and why these may be particularly relevant to the understanding of comorbidity. As well as influencing the risk of mental and physical illness, the lack of resources may facilitate the development of

comorbid conditions in the context of non-comorbid illness by influencing morbidity-driven mechanisms of comorbidity. It is therefore possible that health inequality research to date has underestimated the extent of health inequalities by focusing on either mental or physical health. This premise will be explored in this thesis.

In this thesis I will also consider the impact of mental-physical comorbidity on MHSU. Specifically, I will examine whether comorbidity, as the literature suggests, is associated with greater MHSU, compared to those with non-comorbid mental illness, and if so, why. A plausible explanation might be that worse perceived health and functioning among those with comorbidity increases perceived need of services and thus amplifies service uptake. MHSU patterns over time will also be explored in order to understand to what extent these are driven by poorer perceived health and functioning among those with comorbidity.

Finally, if comorbidity is associated with accumulating social disadvantage it is plausible that comorbidity adversely impacts on social functioning. This may have implications for societal participation and opportunities and is thus an important matter for social justice. Exploring the impact of comorbidity on trajectories of social functioning over time will thus be the final aim of the thesis.

The broad and specific aims of the thesis are thus:

1. To estimate the prevalence of comorbidity, and describe inequalities in mental-physical comorbidity by key socio-demographic and socio-economic factors
    - A1.1 To establish the prevalence of mental-physical comorbidity in an urban community setting.
    - A1.2 To describe the unadjusted distribution mental-physical comorbidity by key socio-demographic and socio-economic factors.
    - A1.3 To estimate independent associations of socio-demographic and socio-economic factors with comorbidity, whilst controlling for explanatory variables.

2. To describe and explain the association between comorbidity and mental health service utilisation and quality
    - A2.1 To estimate the prevalence of MHSU.
    - A2.2 To test associations between comorbidity, and MHSU and quality outcomes.
    - A2.3 To test associations between comorbidity, and perceived health and functioning.
    - A2.4 To test associations between perceived health and functioning, and MHSU outcomes.
    - A2.5 To test the mediating effect of perceived health and functioning in the associations between comorbidity and MHSU outcomes.

3. To describe the trajectories of social functioning by comorbidity

# Chapter 2 Data sources and methods

## 2.1 The SELCoH surveys: context

The primary data source of this project is the NIHR-funded Mental Health Biomedical Research Centre South East London Community Health surveys, Phase 1 and Phase 2 (SELCoH 1, SELCoH 2). The SELCoH surveys are general population surveys carried out at 2 timepoints in the South East London boroughs of Southwark and Lambeth. They contain detailed information on psychiatric symptoms, physical health, socio-demographics and socio-economic status (SES), treatment and service use, social adversity and psychosocial resources. SELCoH 1 was set up in order to provide locally relevant prevalence estimates of mental disorders and risk factors for mental and physical illness. It also aimed to collect data to enable comparisons to the National Surveys of Psychiatric Morbidity, which are regularly carried out by the Office for National Statistics (the most recent surveys took place in 2000 and 2007). SELCoH 2 aimed to follow up respondents from SELCoH 1 in order to examine local health and service use outcomes longitudinally. A second aim of SELCoH 2 was to collect comparable data to a US community study to explore the role of discrimination in health disparities. SELCoH 2 also improved the measures of occupation and social class, and included additional SES measures of individual income and perceived social standing.

The demographic composition of the study catchment area is mixed in terms of ethnicity and SES. Of the population in Southwark and Lambeth 39% are migrants [258] and 60% identify with an ethnic group other than White British; Black groups representing over 25% of the population [435]. The Black African and Black Caribbean ethnic groups represent the largest non-White ethnic minority groups in Lambeth (11.6% Black African; 9.5% Black Caribbean) and Southwark (16.4% Black African; 6.2% Black Caribbean). The area is also socio-economically diverse; the local population holds higher educational qualifications compared to national estimates [436], while the area at the same time is characterised by higher long-term unemployment and greater social deprivation [437, 438]. Importantly, the SELCoH 1 survey took place between 2008 and 2010 when the recession was gaining momentum and unemployment

was on the rise, and SELCoH 2 followed up the sample between 2011 and 2013, in the aftermath of the recession prior to full economic recovery.

The rich detail of the measures included in the surveys in combination with the characteristics of the catchment area makes it a particularly suitable dataset for gaining an in-depth understanding of mental-physical comorbidity and its causes, particularly in relation to social disadvantage.

## 2.2 Data collection

### 2.2.1 Data collection: SELCoH 1

#### 2.2.1.1 Sampling

Private household residents aged 16 or over in Southwark and Lambeth constituted the sampling population of SELCoH 1. Three-thousand-six-hundered addresses, stratified by borough, were randomly selected from the Small User Postcode Address File (PAF). The PAF has near complete coverage of all addresses in Great Britain receiving less than 50 post items per day, and has previously been used for sampling purposed in UK epidemiological research [439]. Households that were vacant, non-residential or non-private households were excluded (n=359), as were duplicated addresses (n=31) and households that had been included in the pilot study (n=16). Another 957 households were excluded where no contact or occupancy were established, as were 76 households where contact was made, but there was no follow-up. The final sample comprised 1698 respondents from 1075 households. Household participation was 51.9%, and participation within households was 71.9% [51]. The sample was broadly representative of the local population in terms of socio-demographic characteristics and economic activity according to the 2001 and 2011 Office of National Statistics Census estimates, although slightly more women than men participated in the survey (see Table A1, Appendix A).

#### 2.2.1.2 S1 Recruitment

Respondents were initially recruited between 2008 and 2010. All selected private households were sent letters and information sheets describing the study and inviting all residents aged 16 or over to take part. These letters were followed up by visits from 2 trained interviewers who first sought to establish

contact with the household and later conducted structured computer-assisted interviews face-to-face with consenting household members. The interviews lasted approximately 1.5 hours and were carried out in respondents' homes. Translators facilitated interviews with non-English speaking respondents, when necessary. Where possible, a short questionnaire asking about basic demographic information was sent to households where no contact was made, and completed by those who refused to participate in the survey.

S1 interviews included questions about socio-demographic and socio-economic characteristics, a range of mental and physical health screens, a set of cognitive tests, questions about health behaviours, stressful life events, treatment and service use, social support, forensic history, caring responsibilities, and work absenteeism and presenteeism. Anthropometric measures were also collected (e.g. blood pressure).

Written informed consent was collected after informing the respondents about the confidentiality of data handling and reminding them that participation was voluntary. Respondents were also able to opt in for separate additional consents including contact for future studies, access to respondents' general practitioner (GP) records, and provision of DNA samples. Following the completion of interviews, respondents were reimbursed with 15 GBP.

### 2.2.2 Data collection: SELCoH 2

Of the 1698 persons interviewed in SELCoH 1, 94% (n=1589) agreed to be re-contacted. Of those who agreed to be re-contacted 1045 completed the SELCoH 2 survey. Reasons for not completing the SELCoH 2 survey are listed in Table 1. No contact was established with 136 of the consenting SELCoH 1 respondents either due to incomplete contact information provided in SELCoH 1, or respondents being non-traceable due to relocation. Another 21 were ineligible to complete the SELCoH 2 survey either due to health reasons or being deceased. Thus, 157 were ineligible to complete SELCoH 2.

Out of the eligible and consenting SELCoH 1 respondents (N=1432), contact was established with 247 (17.2%) persons who refused to complete SELCoH 2. Another 140 (9.7%) SELCoH 1 respondents did not partake due to failure to establish communication after four attempts at contacting them. Thus, 1045 of

consenting and approached respondents in SELCoH 1 participated in SELCoH 2, generating a completion rate of 73.1%.

Seven additional SELCoH 1 respondents who did not provide consent to follow-up at the time of the first interview changed their minds and asked to participate in SELCoH 2 when interviewers visited the household to interview initially consenting members of the same household. Thus, the final sample of SELCoH 1 respondents followed up in SELCoH 2 was N=1052. The SELCoH 2 sample was very similar to the SELCoH 1 sample in terms of socio-demographic characteristics and economic activity, suggesting that systematic loss to follow up was limited (Table A1, Appendix A).

Table 1 Completion and reasons for non-completion of SELCoH 2

| | Consenting S1 (N=1589) | Non-consenting S1 (N=109) | *Total* |
|---|---|---|---|
| **Completed SELCoH 2** | 1045 | 7[a] | 1052 |
| **Reasons for non-completion among ineligible consenting S1 respondents** | | | |
| Incomplete/non-traceable contact information | 136 | | |
| Ineligible due to health | 9 | | |
| Deceased | 12 | | |
| *Subtotal* | 157 | | |
| **Reasons for non-completion among eligible consenting S1 respondents** | | | |
| Refused to participate in SELCoH 2 | 247 | | |
| No established communication after repeated contacts | 140 | | |
| *Subtotal* | 347 | | |

[a] Upon being visited by SELCoH interviewers interviewing other (consenting) members of their household, respondents revised their consenting status and wished to complete the SELCoH 2 interview.

The SELCoH 2 survey replicated large parts of the SELCoH 1 survey. Detailed socio-demographic and socio-economic data were collected, and the health and service use measures remained largely unchanged, as did the questions on health behaviours, functioning and stressful life events. Many of the psychiatric screens included in SELCoH 1 were not retained, but CMDs were nevertheless comprehensively assessed. Several topics were added to SELCoH 2 including attitudes towards help-seeking for mental health problems, subjective perceptions of social status, experiences of discrimination, as well as ethnic identity.

The interview procedure was very similar to SELCoH 1. However, in order to maximise retention the option of a computer-assisted telephone interview (CATI) was provided to respondents who had relocated outside London. This interview approach was used for 29 (3%) of the SELCoH 2 respondents. The CATI used a shortened interview protocol, omitting certain topics covered in SELCoH 2.

In order to distinguish variables composed of data from the different phases of SELCoH, the suffixes of "(S1)" and "(S2)" are added to variable names to signify measures from SELCoH 1 and SELCoH 2, respectively, and "(S1+S2)" indicates that a variable is composed of measures from both surveys.

## 2.3 Mental and physical health measures

The measures used to ascertain mental and physical health in SELCoH 1 included self-reported longstanding illness and 2 structured psychiatric interview schedules which screened for the presence of common mental disorder symptoms (CMDS) (Revised Clinical Interview Schedule; CIS-R) and psychotic symptoms (PS) (Psychotic Screening Questionnaire; PSQ) [440]. From the SELCoH 2 dataset a variable of mental illness was composed using the longstanding illness measure and the CIS-R. The process of deriving these is outlined in the sections below.

### 2.3.1 Longstanding illness

#### 2.3.1.1 Longstanding illness (S1)

The longstanding illness item asked: "Do you have any long-standing illness, disability or infirmity? By long-standing I mean anything that has troubled you over a period of time or that is likely to affect you over a period of time?". Endorsement of longstanding illness was followed by asking respondents to specify all relevant illnesses by selecting from a list of 17 pre-specified conditions. If an illness or ailment did not apply to any of the pre-specified categories, respondents had the option of selecting an "other" category and describing it to the interviewer. The reported illnesses and ailments were recoded according to broad bodily systems. The pre-specified illness categories, the specified "other" illnesses as well as the derived categories are

summarised in Table 2. Raw data from the specified “other” conditions contributing to the “other” groupings can be found in Table A2 in Appendix A. This measure replicated the longstanding illness measure used in the Health Surveys for England [441, 442].

Table 2 Categorisation of longstanding illnesses (SELCoH 1)

| PRE-SPECIFIED CATEGOREIS | n | SPECIFIED "OTHER" | n | DERIVED CATEGORIES | n |
|---|---|---|---|---|---|
| **PHYSICAL** | | | | | |
| Asthma | 135 | Other respiratory problems (e.g. COPD, chronic coughs) | 18 | Respiratory problems | 167 |
| Chronic bronchitis | 8 | | | | |
| Other chest trouble | 22 | | | | |
| Stomach or digestive disorder | 64 | Other gastrointestinal or digestive problems (e.g. hernia, Crohn's disease) | 13 | Gastrointestinal or digestive problems | 100 |
| Irritable bowel syndrome | 17 | | | | |
| Liver trouble | 17 | Hepatitis B and C | 3 | Liver trouble | 19 |
| Rheumatic disorder or arthritis | 130 | Other musculoskeletal problems (e.g. chronic pain, joint problems) | 68 | Musculoskeletal problems | 262 |
| Back trouble | 115 | | | | |
| Heart trouble | 52 | Other conditions of the circulatory system (e.g. high cholesterol, high blood pressure) | 21 | Heart or circulatory problems | 204 |
| High blood pressure | 158 | | | | |
| Stroke | 14 | | | | |
| Migraine | 50 | Other neurological problems (e.g. eye sight, hearing, memory problems, sinuses) | 48 | Neurological and sensory problems | 105 |
| Epilepsy/fits | 12 | | | | |
| Gynaecological problem | 33 | Other reproductive system (e.g. prostate and contraception) | 5 | Reproductive system | 37 |
| Cancer | 24 | Other neoplasms | 6 | Neoplasms | 30 |
| Diabetes | 78 | - | | Diabetes | 78 |
| - | | Endocrine disorders (thyroid problems, lupus) | 27 | Endocrine disorders | 27 |
| - | | Skin problems (e.g. psoriasis, eczema) | 29 | Skin problems | 29 |
| - | | Bladder and kidney problems (e.g. kidney | 17 | Bladder and kidney problems | 17 |

| | | | | | |
|---|---|---|---|---|---|
| | | failure, incontinence) | | | |
| | | Blood disorders (e.g. anaemia) | 19 | Blood disorders | 19 |
| - | | Other physical conditions (e.g. allergies, HIV, ME) | 18 | Other physical conditions | 18 |
| Total | 506 | Total | 291 | Total | 639 |
| **MENTAL** | | | | | |
| Depression or other nervous illness | 103 | Non-psychotic mental disorder | 16 | Non-psychotic mental disorder | 116 |
| - | | Psychotic mental disorder | 4 | Psychotic mental disorder | 4 |
| Total | 103 | Total | 19 | Total | 119 |
| **REFUSED TO SPECIFY** | | | | | |
| - | | Refused to specify | 1 | Refused to specify | 1 |
| TOTAL | 534 | TOTAL | 311 | TOTAL | 672 |

*Note*: Categories are not mutually exclusive, counts do therefore not add up. Specified “other” illnesses were categorised based on descriptions from respondents; for raw data see Appendix A, Table A2.

#### 2.3.1.1.1 Data cleaning

A number of discrepancies were detected in cleaning the longstanding illness variable. Two respondents reported longstanding illness, and specified “other” illnesses (“trouble with tonsils” and “gout”), but did not endorse the “other” category. Given that illnesses had been described, these were interpreted as coding errors and were included in the category of “other” illnesses.

Three respondents specified “other” illnesses without indicating that they had a longstanding illness in the initial screening question. These were: “lupus and chronic bladder infection”; “depression and gynaecological problems”; and “contraception”. These were re-coded so that they were included in the longstanding illness measure.

Another 4 respondents reported longstanding illness, although none was specified in the follow-up questions. As there was no evidence of a longstanding illness, this was interpreted as coding errors and they were therefore recoded to no longstanding illness.

One respondent indicated an “other” longstanding illness but refused to specify it. It was therefore not possible to classify it as physical or mental, and it was hence coded as missing. An additional 7 respondents refused to answer the longstanding illness item altogether, and an additional 3 were true missing, generating a total of 11 missing values from this measure.

After this cleaning process, there were 671 respondents who reported a long-standing illness, of which 311 reported an “other” longstanding illness. Although some listed complaints could be argued for exclusion (e.g. allergies, short sightedness etc.), I decided to retain these as longstanding illnesses, given that respondents perceived them as sufficiently important to report.

Of those reporting longstanding illnesses (N=671), 17.2% (n=119) reported mental illnesses, 95.9% (n=639) reported physical illness, and 13.1% (n=87) reported both. Thus, few reported longstanding mental illness without reporting longstanding physical illness, while physical illness was commonly reported in the absence of mental illness.

#### 2.3.1.2 Longstanding illness (S2)

The longstanding illness measure was nearly identical to the question asked in the SELCoH 1 survey. It asked: “Do you have any long-standing health problem, illness or disability? By long-standing I mean any mental or physical health problem that has troubled you over a period of time or that is likely to affect you over a period of time in the future? This includes recently identified problems” [441, 442]. The underlined phrases were added or modified in SELCoH 2 for clarification and to ensure comprehensive inclusion of illnesses. As with SELCoH 1, disclosure of a longstanding illness prompted respondents to specify all relevant illnesses from a prescribed list, and/or describe any other illnesses by selecting the “other” category. The pre-specified illness categories were the same as those in SELCoH 1, with the exceptions of “other chest problem”, “irritable bowel syndrome” and “back trouble” being dropped, and “HIV” being added.

The longstanding illness measure in SELCoH 2 was only used in this thesis for the purposes of deriving a variable of mental illness symptoms (MIS) at follow-up. Therefore “depression or other nervous illness” was the only pre-specified category used. The illnesses specified in selecting the “other category” were also examined in order to identify additional mental illnesses.

The 29 respondents from SELCoH 2 who were interviewed using CATI were not asked the long-standing illness questions, as this section was omitted from the shortened interview protocol for telephone interviews. These were coded as missing.

### 2.3.2 Revised Clinical Interview Schedule (CIS-R)

#### 2.3.2.1 Revised Clinical Interview Schedule (CIS-R) (S1)

Common mental disorder symptoms (CMDS) were measured using the CIS-R [443]; a structured interview schedule validated for lay interviewers. It asks structured questions about psychiatric morbidity, organised into 14 symptom sections and an additional section on overall impact (Table 3). For each symptom domain, a screening question is asked establishing whether the respondent has experienced the symptoms in the past month. If endorsed, follow up questions pertaining to the past seven days are asked. Depending on

how the respondent answers the questions, the CIS-R skips certain questions, asking a minimum of 28 questions if no symptoms have been experienced.

For each of the 14 symptom domains, a maximum score of 4 may be obtained (with the exception of “depressive ideas” where the maximum score is 5). The minimum score of 0 is attributed to a domain if the screening question is not endorsed. These are added up to produce a total CIS-R score of psychiatric morbidity ranging from 0-57. The cut-off at 12 or more indicates presence of common mental disorder (CMD), and the cut-off at 18 or more indicates presence of symptoms that are likely to require treatment [53, 267, 443]. With the use of specific algorithms, the CIS-R also identifies a set of neurotic disorders according to the diagnoses criteria of the 10$^{th}$ version of the World Health Organisation’s International Classification of Diseases, including depressive episodes (mild, moderate and severe), phobias, panic disorder, generalised anxiety disorder, mixed anxiety and depression, obsessive compulsive disorder a non-specific neurotic disorder.

#### 2.3.2.2 Revised Clinical Interview Schedule (CIS-R) (S2)

The CIS-R was used to measure CMDS in SELCoH 2 [443], asking the identical questions as those in SELCoH 1 (see section 2.3.2.1). As in SELCoH 1, the 12 or more point cut-off was used to indicate the presence of CMDS. All SELCoH 2 respondents completed the CIS-R.

Table 3 Symptom domains of the CIS-R (reproduced from McCrea [444])

| | |
|---|---|
| **Somatic symptoms** | Aches, pains or any sort of discomfort that was brought on or made worse because you were feeling low, anxious or stressed. |
| **Fatigue** | Feeling tired or lacking in energy for any reason other than physical exercise. |
| **Concentration/forgetfulness** | Problems with concentrating on what you were doing or forgetting things. |
| **Sleep** | Problems with trying to get to sleep or with getting back to sleep, or sleeping more than usual. |
| **Irritability** | Feeling irritable or short tempered with those around you (over things that seem trivial looking back on them). |
| **Worry about physical health** | Worrying about your own physical health (all respondents) or worrying that you might have a serious physical illness (only respondents who didn't report a long-standing illness, disability or infirmity). |
| **Depression** | Feeling sad, miserable or depressed, or not being able to enjoy or take an interest in things as much as usual. |
| **Depressive ideas** | Feeling guilty, feeling hopeless, feeling not as good as others and thoughts of suicide (only respondents who scored 1 or more in the previous Depression section.) |
| **Worry** | Worrying about anything other than your own physical health. |
| **Anxiety** | Feeling anxious or nervous, or finding your muscles tense or that you couldn't relax. |
| **Phobias** | Feeling anxious, nervous or tense about any specific things or situations when there was no real danger, or avoiding any situation or thing because it would have made you feel nervous or anxious, even though there was no real danger. |
| **Panic** | Anxiety or tension getting so bad that you got in a panic (for example, feeling that you might collapse or lose control unless you did something about it). |
| **Compulsions** | Finding that you kept on doing things again and again when you knew you had already done them (for example, checking things like taps or washing yourself when you had already done so). |
| **Obsessions** | Having thoughts or ideas over and over again that you found unpleasant and that you would have preferred not to think about, that still kept on coming into your mind. |

### 2.3.3 Psychotic Screening Questionnaire (PSQ) (S1)

PS were measured using the PSQ [440]. The PSQ is a lay interview schedule which asks questions about PS in the past year across 5 domains to indicate possible psychosis. It has been validated against robust clinical assessments [440], and PSQ cases have also been found to share similar risk factors to those diagnosed with psychosis through clinical interview [71, 287, 445].

The 5 PSQ domains are hypomania, thought insertion, paranoia, strange experiences and hallucinations. For each domain an introductory question is asked, followed by 1 or 2 key questions. Conflicting coding methods of the PSQ have previously been applied to identify positive screens. For the purposes of this thesis, a conservative approach was adopted, illustrated in Table 4. This identified PS by endorsement of 1 or more of the primary key questions for thought insertion, strange experiences and hallucinations, and the secondary key question for paranoia [71, 287, 445]. The hypomania domain was excluded in line with Morgan et al. [72, 446].

The PSQ was originally intended to be used such that primary key questions are only asked if the introductory question is endorsed, and secondary key questions are only asked following endorsement of primary key questions. In the SELCoH survey, respondents occasionally had the opportunity to answer the primary and secondary key questions, despite negative responses to the introductory or primary key questions. Thus, key questions were sometimes endorsed without endorsing the introductory question. For this project, anyone who endorsed a screening question was coded as reporting PS, regardless of how the introductory question was answered.

The PSQ was also initially intended to be discontinued after the identification of a PS by endorsement of a screening question, and issue a referral for further clinical assessment. Consistent with previous surveys [53] SELCoH did not follow this structure but asked the all introductory questions, regardless of whether a PS was identified.

Table 4 Psychotic screening questionnaire items by domain

| |
|---|
| Hypomania[a] |
| i. Over the past year, have there been times when you felt very happy indeed without a break for days on end? |
| ii. Was there an obvious reason for this? |
| iii. Did your relatives or friends think it was strange or complain about it? |
| Thought insertion |
| i. Over the past year, have you ever felt that your thoughts were directly interfered with or controlled by some outside force or person? |
| **ii. Did this come about in a way that many people would find hard to believe, for instance through telephony?** |
| Paranoia |
| i. Over the past year, have there been times when you felt that people were against you? |
| ii. Have there been times when you felt that people were deliberately acting to harm you or your interests? |
| **iii. Have there been times when you felt that a group of people was plotting to cause you serious harm or injury?** |
| Strange experiences |
| i. Over the past year have there been times when you felt that something strange was going on? |
| **ii. Did you feel it was so strange that people would find it very hard to believe?** |
| Hallucinations |
| i. Over the past year, have been times when you heard or saw things that other people couldn't |
| **ii. Did you at any time hear voices saying quite a few words or sentences when there was no-one around that might account for it?** |

[a] Excluded domain, i. Introductory question, ii. Primary key question, iii. Secondary key question.
Respondents endorsing one or more screening questions indicated in bold were categorised as PS cases

In total, 169 respondents endorsed at least 1 screening question on the PSQ. Eight respondents had missing values for all screening questions; 6 due to refusal to respond and 2 were true missing. Data across the screening questions were partially complete for 3 cases. One respondent answered a screening question positively, and was made a case. The other 2 were coded as missing, generating a total of 10 missing items from the variable (7 due to refusal to respond, and 3 true missing).

### 2.3.4 Derived health variables

#### 2.3.4.1 Physical illness (S1)

Physical illness information was obtained from the survey item enquiring about longstanding illness (2.3.4.1). As illustrated in Figure 2, physical illness was defined by the indication of at least 1 of the listed physical illness categories. Any physical illness that was described in selecting the “other” category was also included (Table 2). In total 639 respondents were categorised as having a physical illness.

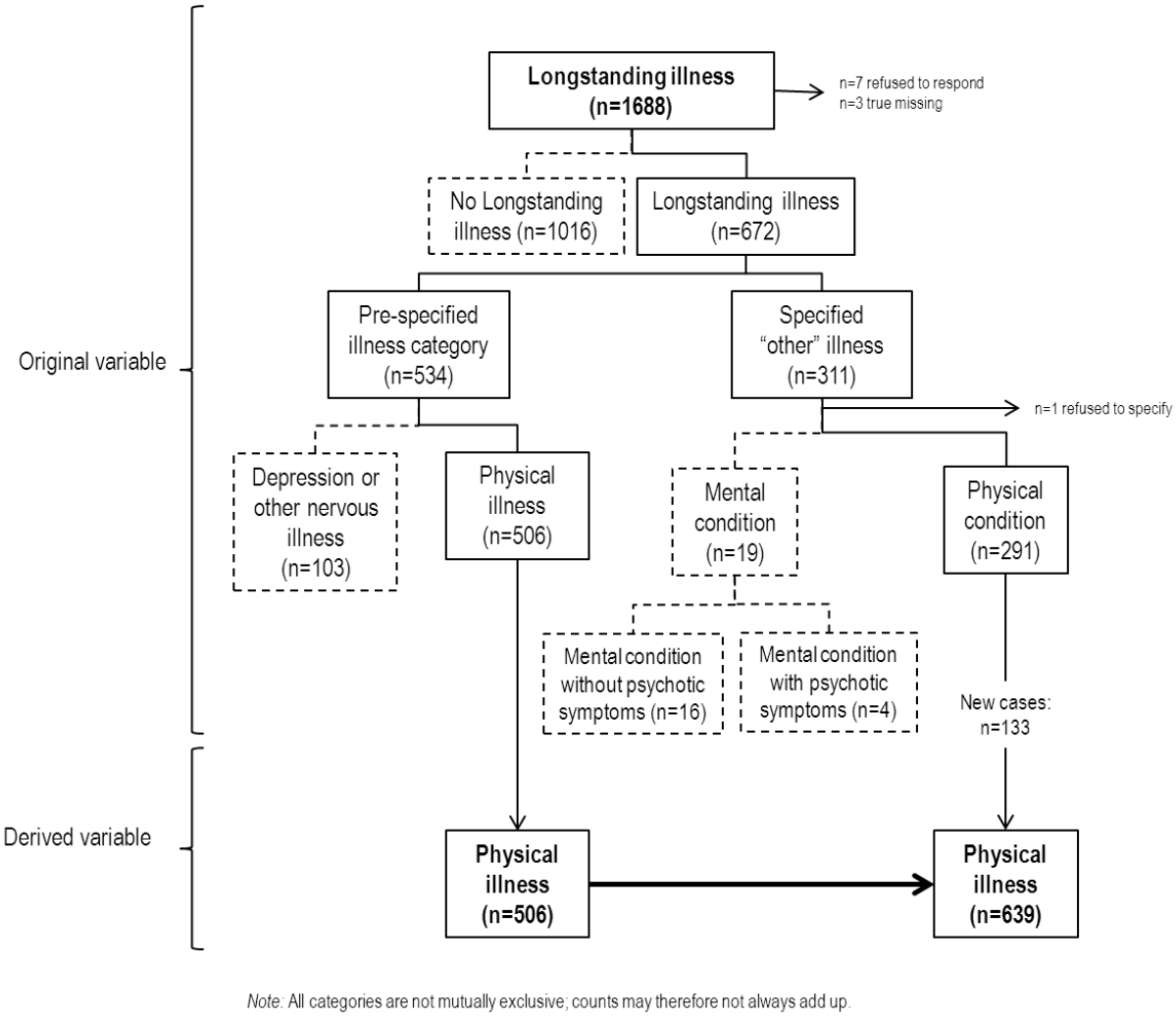


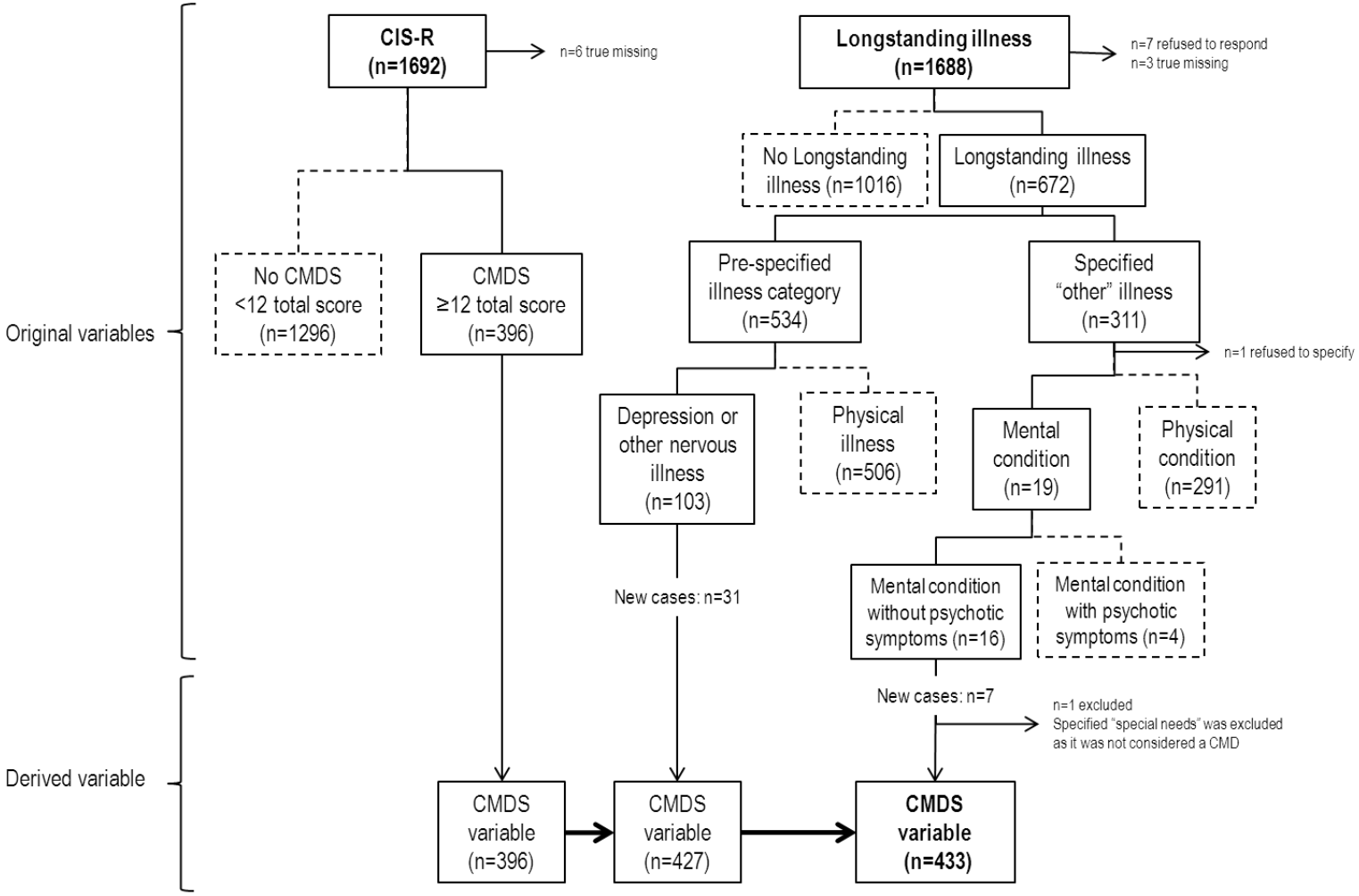

Figure 2 Derived physical illness variable

#### 2.3.4.2 Common mental disorder symptoms (S1)

A flowchart of the process of deriving the CMDS variable is shown in Figure 3. The conventional 12-point cut-off on the CIS-R was used to indicate CMDS. Given that the CIS-R score is predominantly based on symptoms experienced within the past month and week, it may not have captured everyone with long-standing mental health problems due to fluctuating symptom severity. Therefore, self-reported CMD was also included in the CMDS measure. These included those who in the longstanding illness item indicated that they had “depression or other nervous illness”, or described any other non-psychotic mental disorder by selecting the “other” category.

Most of those who endorsed “depression or other nervous disorder” had been captured by the CIS-R (72 of 103), but it nevertheless introduced 31 new cases. Nine of the 16 non-psychotic conditions specified in selecting the “other” longstanding illness category had been captured by the other 2 measures. Of the remaining 7, 1 person who specified that they had “special needs” was excluded, as it was not possible to verify as a CMD. Thus 6 new cases were added to the CMDS variable. These were single cases of attention deficit hyperactivity disorder, “obsessive compulsive disorder (OCD) with anger issues”, and eating disorder, and 3 cases of dyslexia.

There were 6 true missing cases from the CIS-R measure, generating a total of 7 missing for this measure (including the respondent reporting special needs).

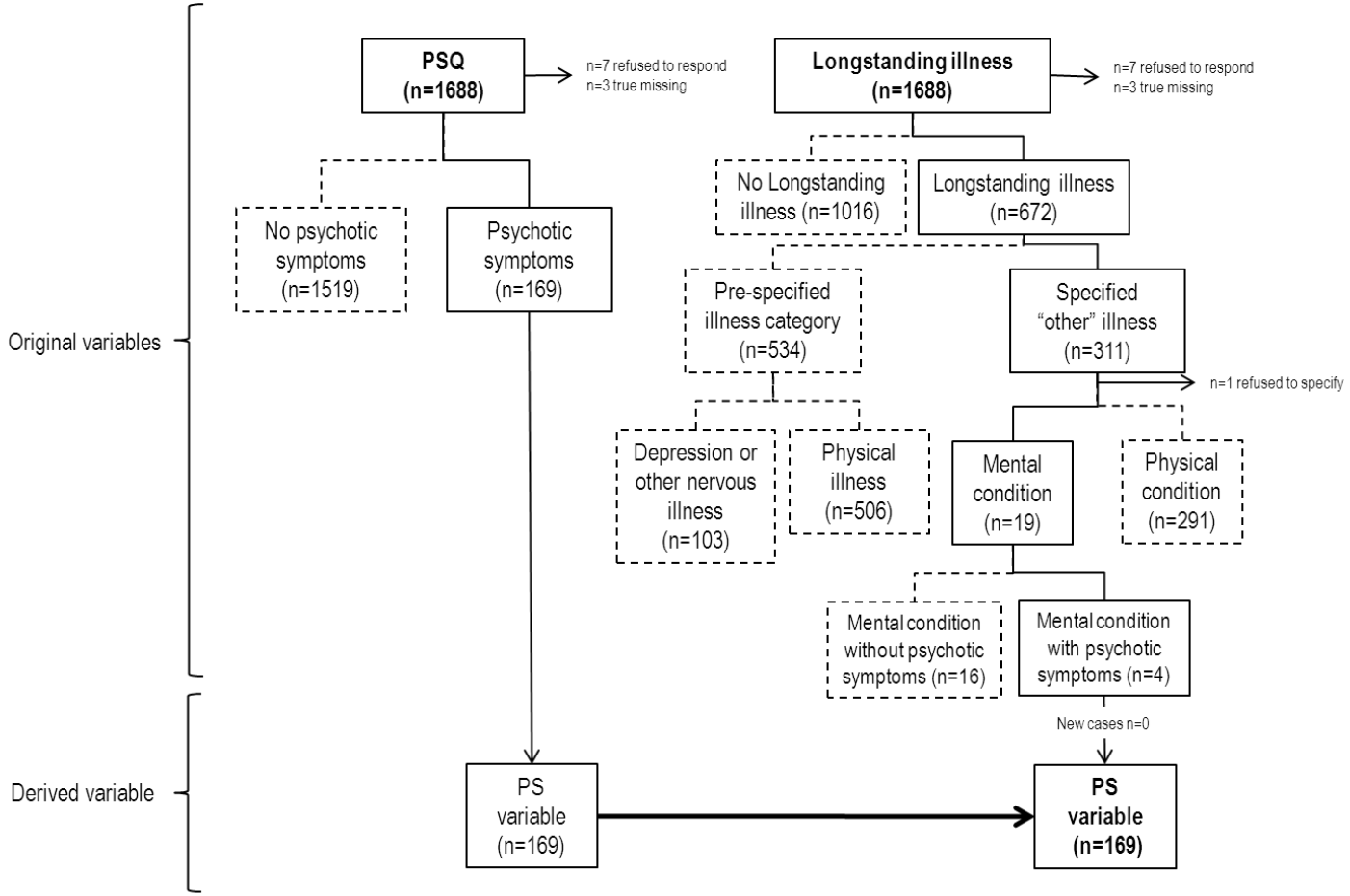



*Note:* All categories are not mutually exclusive; counts may therefore not always add up.
CIS-R= Revised clinical interview schedule; CMDS=common mental disorder symptoms

Figure 3 Derived common mental disorder symptoms (CMDS) variable

#### 2.3.4.3 Psychotic symptoms (S1)

The PS variable was informed by those who reported PS as indicated by the PSQ. Self-reported longstanding mental illnesses characterised by PS were also considered for inclusion. Four respondents reported such mental illnesses: 1 reported bi-polar disorder, 2 reported paranoid schizophrenia, and 1 “mental disorder” (which had been classed as psychotic mental disorder as the respondent scored above threshold on the PSQ). As illustrated in Figure 4, all reported psychotic disorders had been captured by the PSQ.




*Note:* All categories are not mutually exclusive; counts may therefore not always add up.
PSQ=Psychotic screening questionnaire; PS=Psychotic symptoms

Figure 4 Derived psychotic symptoms (PS) variable

### 2.3.4.4 Mental illness symptoms (MIS) (S1)

The CMDS and the PS variables were combined to a composite MIS variable (Table 5). If either CMDS or PS were reported, respondents were classified into the MIS category. The special needs case which was previously excluded from the CMDS variable was also included, generating a total of 495 cases of MIS. In total, 10 cases were missing.

Table 5 Composite mental illness symptoms (MIS) variable

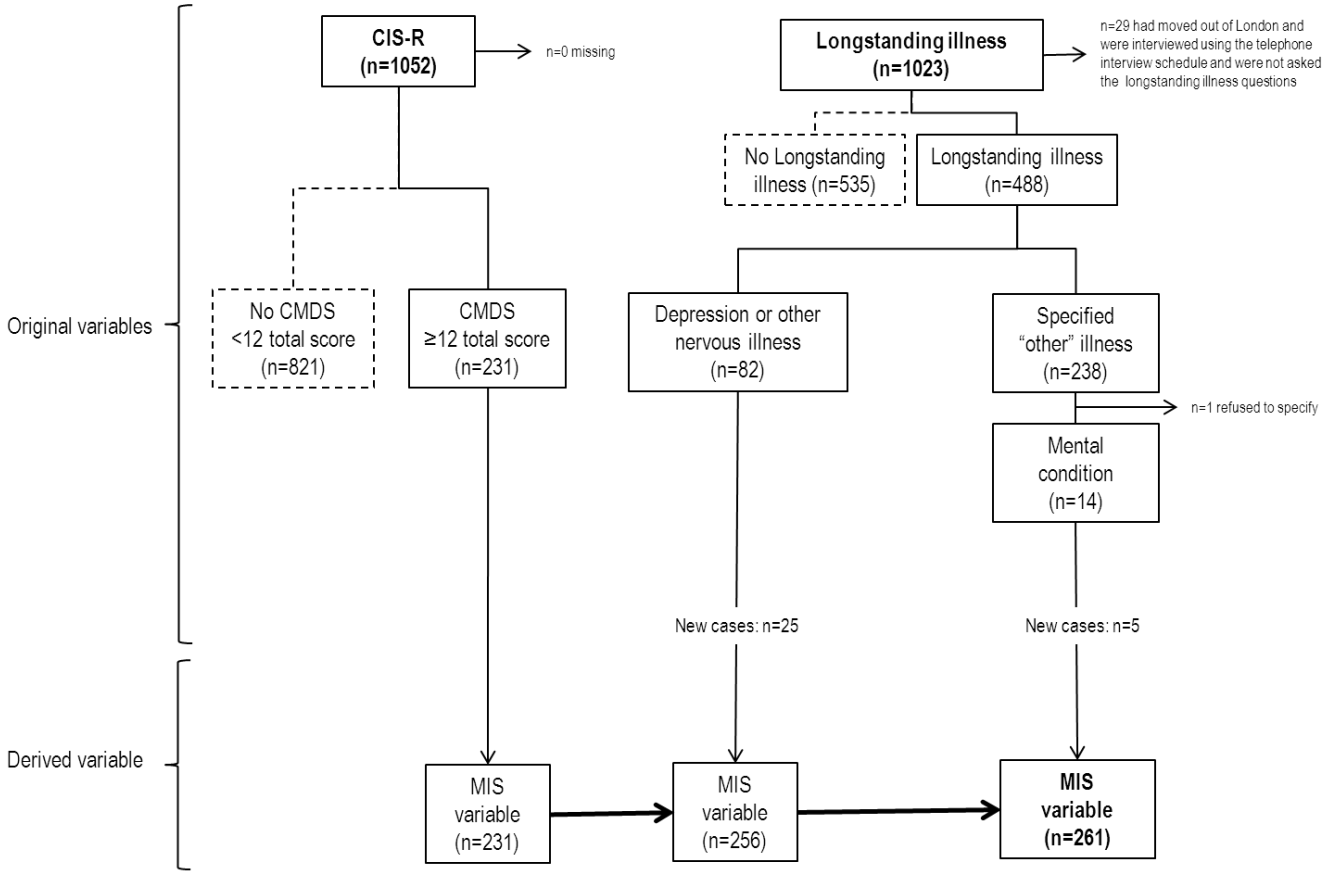
| | **Psychotic symptoms (PS)** | | | | |
|---|---|---|---|---|---|
| **Common mental disorder symptoms (CMDS)** | No | Yes | Refuse to respond | True missing | *Total n* |
| No | 1193 | 60 | 3[b] | 2[b] | 1258 |
| Yes | 320 | 108 | 4 | 1 | 433 |
| Excluded | 1[a] | 0 | 0 | 0 | 3 |
| True missing | 5[b] | 1 | 0 | 0 | 6 |
| *Total n* | 1519 | 169 | 7 | 3 | 1698 |

Shaded cells indicate inclusion of mental illness, total cell count = 495.
[a] Self-reported special needs
[b] Values coded as missing, total cell count = 10

### 2.3.4.5 Mental illness symptoms (MIS) (S2)

The longstanding illness question and the CIS-R were used to compose a variable of MIS in SELCoH 2. This variable was used as an explanatory factor in prospective analyses of the thesis. The process of deriving this measure is depicted in Figure 5. Two-hundred-thirty-one respondents screened above the threshold for CMD on the CIS-R. Of the 82 who selected the “depression or other nervous illness” category in the longstanding illness measure, 57 were captured by the CIS-R and 25 new cases of mental illness were added to the MIS category. Finally, illnesses specified by selecting the “other” longstanding illness category were considered. From this group 14 were identified as mental illnesses, of which nine were already captured by the other 2 measures, thus adding 5 new cases (1 case of eating disorder, 1 case of OCD, 1 case of psychosis, and 2 cases of Asperger’s syndrome).

Given that the PSQ was not included in the SELCoH 2 interviews, PS did not contribute to the S2 MIS measure. The variable composition was thus more comparable to the S1 CMDS variable than the S1 MIS variable. However, given that a range of mental illnesses was added from the longstanding illness measure, including 1 case of psychosis, the variable will henceforth be referred to as S2 MIS.




*Note:* All categories are not mutually exclusive; counts may therefore not always add up.
CIS-R= Revised clinical interview schedule; CMDS=common mental disorder symptoms, MIS=mental illness symptoms

Figure 5 Mental illness symptoms variable in SELCoH 2

#### 2.3.4.6 Comorbidity variables

Three comorbidity variables were derived for the SELCoH 1 dataset: MIS-physical comorbidity, CMDS-physical comorbidity and PS-physical comorbidity. All variables were created by cross-tabulating mental illness by physical illness to generate four categories: 1) no identified illness, 2) non-comorbid mental illness, 3) non-comorbid physical illness, and 4) comorbid mental-physical illness. Thus, the comorbidity variables differed according to the type of mental illness variable cross-tabulated against physical illness: MIS, CMDS or PS.

##### 2.3.4.6.1 CMDS-physical comorbidity (S1)

The CMDS variable was cross-tabulated by longstanding physical illness to generate a four category comorbidity variable, illustrated in Figure 6. In total, 18 respondents had missing data, leaving a total sample of 1680 respondents. Nine cases were “true missing” (6 from CMDS, 3 from physical illness), 8 refused to respond to the longstanding illness item, and 1 case of “special needs” was excluded as it was not classed as a CMD.

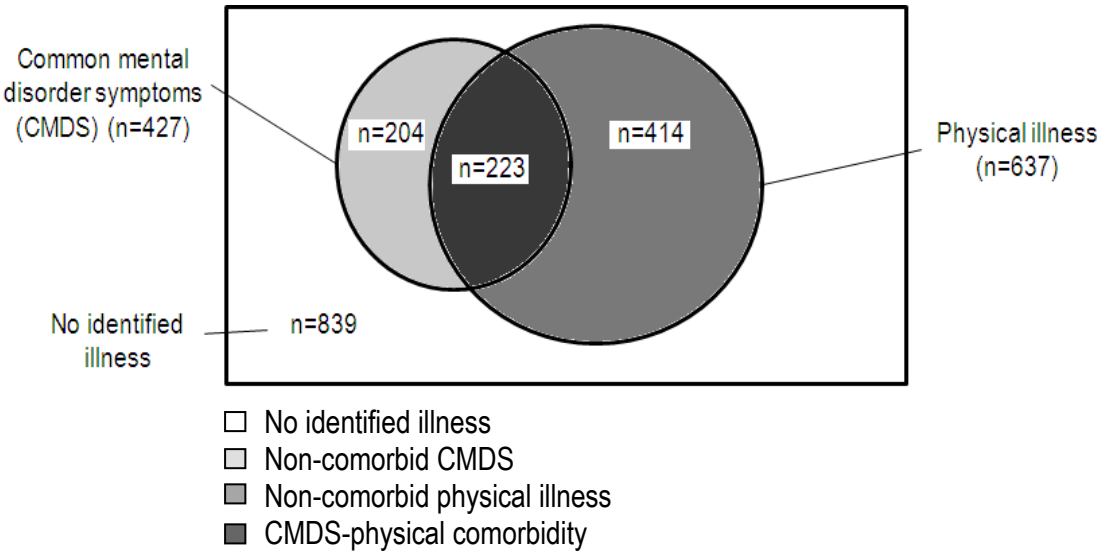



Figure 6 CMDS-physical comorbidity variable

##### 2.3.4.6.2 PS-physical comorbidity (S1)

Cross-tabulating PS by physical illness generated the categories for the PS-physical comorbidity variable (Figure 7). Four respondents were “true missing”, 3 refused to answer the longstanding illness questions, 2 refused to answer the PSQ questions, and 5 refused to answer both the PSQ and the longstanding illness questions.

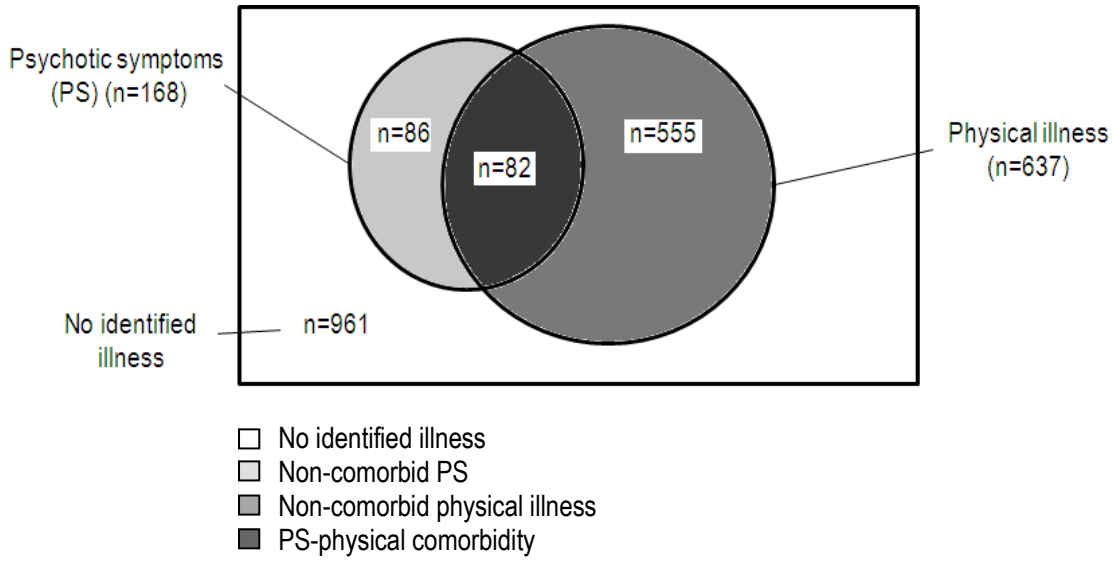



Figure 7 PS-physical comorbidity variable

2.3.4.6.3 Mental illness symptoms-physical comorbidity (S1)

The MIS variable was cross-tabulated with physical illness to generate an overall MIS-physical comorbidity variable (Figure 8). Two-hundred-forty-seven respondents reported non-comorbid MIS. Of these, 68.2% (n=160) reported non-comorbid CMDS, 15.1% (n=42) reported non-comorbid PS and 16.8% (n=43) reported both.

242 respondents reported mental-physical comorbidity. Of these 66.5% (n=159) reported CMDS-physical comorbidity, 7.2% (n=18) reported PS-physical comorbidity, and 26.1% (n=64) reported CMDS, PS as well as physical illness. One respondent, representing 0.2% of the sample, reported special needs and physical illness. Data for 17 respondents were missing; 9 due to true missing and 8 due to refusal to respond.

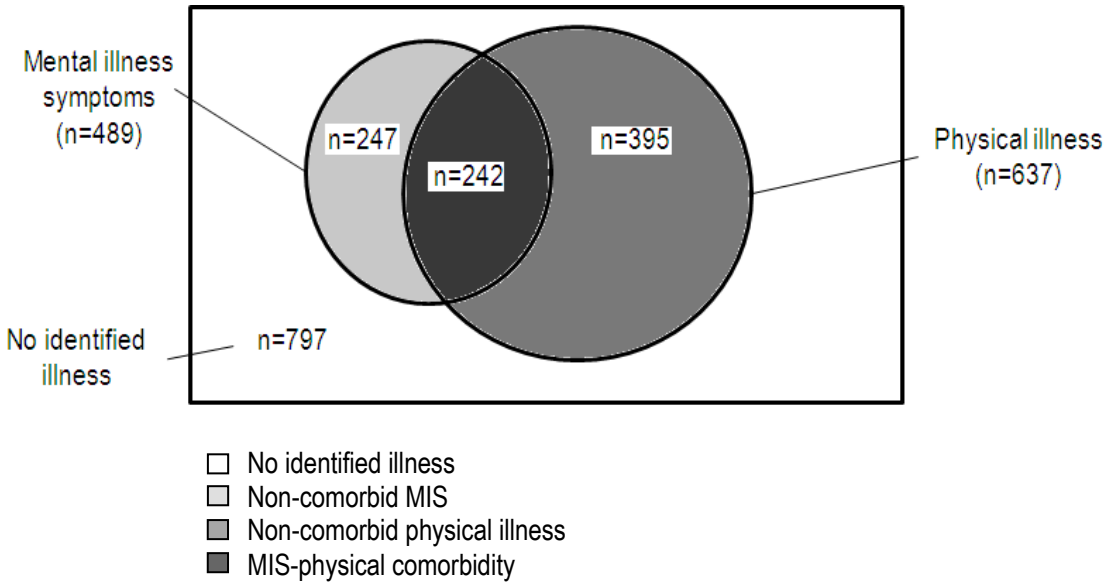



Figure 8 Mental-physical comorbidity variable

## 2.4 Mental health service use measures

The SELCoH surveys asked about care received in the past 12 months for mental health reasons from services and from informal care sources. From these questions, 3 main outcomes of mental health service use (MHSU) were obtained: mental health service use at S1 (MHSU (S1)), mental health service use at S2 (MHSU (S2)) and mental health service use patterns (MHSU (S1+S2)). Additional variables pertaining to satisfaction were also used for each of the timepoints from the SELCoH surveys. Furthermore, measures of mental health service quality at the practice level were obtained for a subsample of S1 respondents for whom a primary care surgery in Southwark or Lambeth could be attributed. These measures came from a separate data source of primary care quality indicators (Quality Outcomes Framework, QOF). The process of preparing the service use outcomes is outlined in the sections below.

### 2.4.1 Mental health service use

Service use for mental health problems (being “anxious or depressed” or having “a mental, nervous or emotional problem”) over the past 12 months was measured in both the SELCoH surveys. Those who endorsed MHSU were asked to specify what types of services they had used. All those who endorsed MHSU were asked about satisfaction with the care received, and reasons for dissatisfaction (if dissatisfied).

#### 2.4.1.1 Primary and secondary mental health service use (S1)

Figure 9 shows the process of deriving a single variable of primary and secondary MHSU. In SELCoH 1, 2 separate questions asked about any care received from services and from informal care sources in the past 12 months for mental health problems. The service use question asked: “In the past 12 months, have you spoken to a GP or family doctor, a psychological therapist/counsellor or other sources of help on your own behalf, either in person or by telephone about being anxious or depressed or a mental, nervous or emotional problem?”. There were 3 response options to the question: “yes”, “no (had the problem but did not see anyone)” and “N/A (never had these kinds of problems)”. Those who reported that the question was inapplicable to them

because they had never experienced any mental health problems in the past year and those who reported no service use, despite perceiving a need for services, were grouped in a category of “no MHSU”. Those who indicated that they had used services were asked to specify what type of mental health service they had used, selecting all that applied. The options were GP, psychological therapist/counsellor, mental health specialist, or other (specified). Given that respondents were prompted to select all that applied, the categories overlapped. Thus, for the purposes of generating mutually exclusive categories for the derived variable, all of those reporting service use provided by a psychological therapist/counsellor or a mental health specialist were grouped into a category labelled “secondary care use”, even if they also reported use of GP services. Those who reported use of GP services, but no use of either of the secondary care sources, were placed in a category labelled “primary care use only”. The overlap between the GP, psychological therapist/counsellor and mental health specialist is illustrated in Figure 10.

Thirty people reported use of “other” sources. Out of these, 12 reported “other” sources exclusively, without reporting use of services from a GP, psychological therapist/counsellor or a mental health specialist. Examples of these included “nurse” and “life coach”, and were not possible to classify into primary or secondary care sectors with certainty. They were therefore excluded from the derived variable. A full list specifying the excluded “other” services reported is presented in Table A3 in Appendix A.

The final 12-month primary and secondary MHSU variable thus had 12 excluded respondents who could not be attributed to neither primary nor secondary care sectors. Further, data for 2 respondents were missing due to refusal to respond to the screening question.

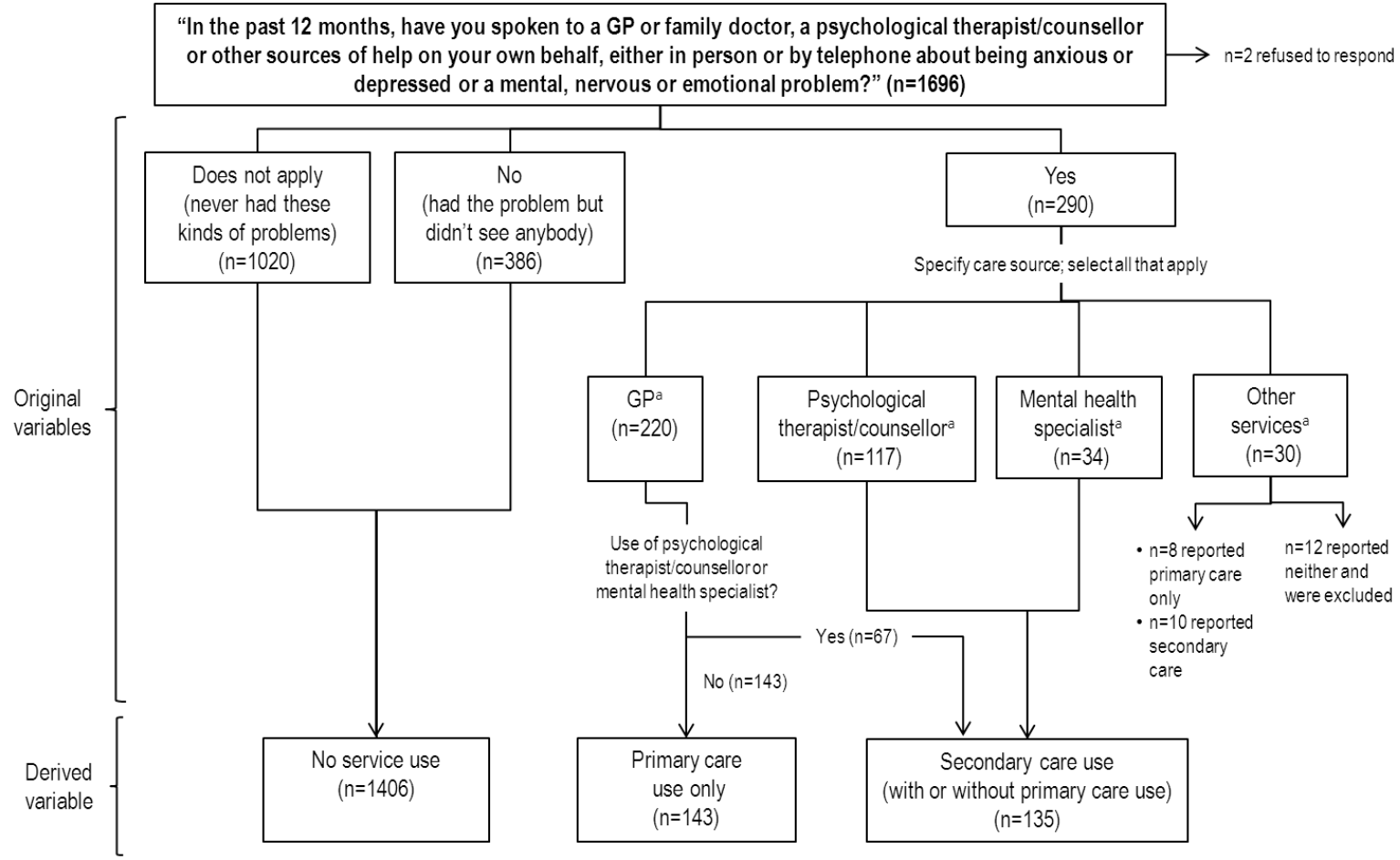



Figure 9 Derived variable of primary and secondary mental health service use in SELCoH 1

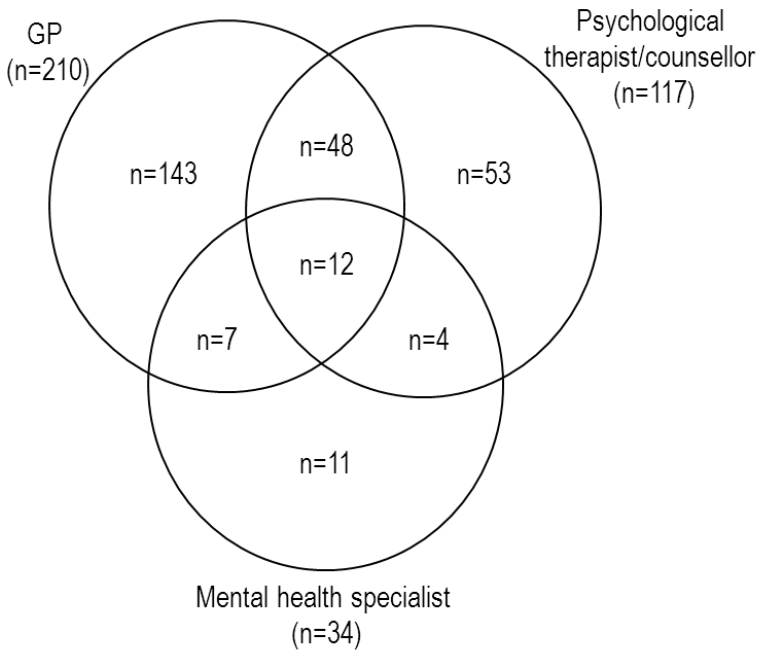



Figure 10 Overlap between different sources of service use reported in SELCoH 1

### 2.4.1.2 Primary and secondary mental health service use (S2)

The questions and follow-up questions asked in SECLoH 2 are shown in a flowchart in Figure 11. In contrast to SELCoH 1, the initial MHSU question in S2 was more inclusive such that it captured both informal and formal care sources. Respondents were then allowed to specify all the care sources that applied in follow-up questions. The question asked: “In the past 12 months, have you spoken anyone (professional or non-professional), either in person or by telephone about problems with your emotions or nerves or your use of alcohol or drugs?”. In contrast to the 3 response options in SELCoH 1, this question could only be answered as yes/no. Instead of a third option of “no, but had the problem”, perceived need for services was explicitly measured in a follow-up question among those responding “no” to care-receipt. This question asked “Was there ever a time during the past 12 months when you felt that you might need to see a professional because of your emotions or nerves or your use of alcohol or drugs?”. In order to make the S1 and S2 MHSU variables comparable, this question was not used to distinguish respondents by perceived need. Instead, all who responded “no” the initial service use questionwere

grouped in a category of “no MHSU” regardless of perceptions of need for services.

Those who indicated care-receipt for mental health problems were asked to specify what type of care source they had used, selecting all that applied: GP, psychological therapist/counsellor, mental health specialist, friends, family or other (specified). As with SELCoH 1, these categories overlapped. Consistent with the MHSU (S1) variable, those reporting use of psychological therapist/counsellor services or a mental health specialist were grouped into a category of “secondary care use” (with or without using GP services). Those who reported GP service use, but no use of either of the secondary care sources, were categorised into “primary care use only”. The overlap between the GP, psychological therapist/counsellor and mental health specialist in SELCoH 2 is depicted in Figure 12.

Given that the initial MHSU question in S2 also asked about any use of informal care sources, a large number of respondents reported service use which did not fall into either of the primary or the secondary care categories. Of the 209 who reported use of “other” or informal care sources, 37 were included in the primary care category and 30 were included in the secondary care group. One-hundred-twenty-four reported exclusive use of informal care sources (family, friends or spiritual leaders). These were added to the “no MHSU” category. Eighteen reported exclusive use of “other” care sources. One person specified “co-workers” as an “other” care source, and was also added to the “no MHSU” category. The remaining 17 who reported “other” care sources specified professionals of some sort. As in SELCoH 1, these consisted of a heterogeneous mix of professionals and were excluded given that they were difficult to allocate to primary or secondary care categories. The “other” services reported by the 17 excluded respondents are listed in Table A3 in Appendix A.

The final derived variable of MHSU contained 18 excluded values and no other missing data.

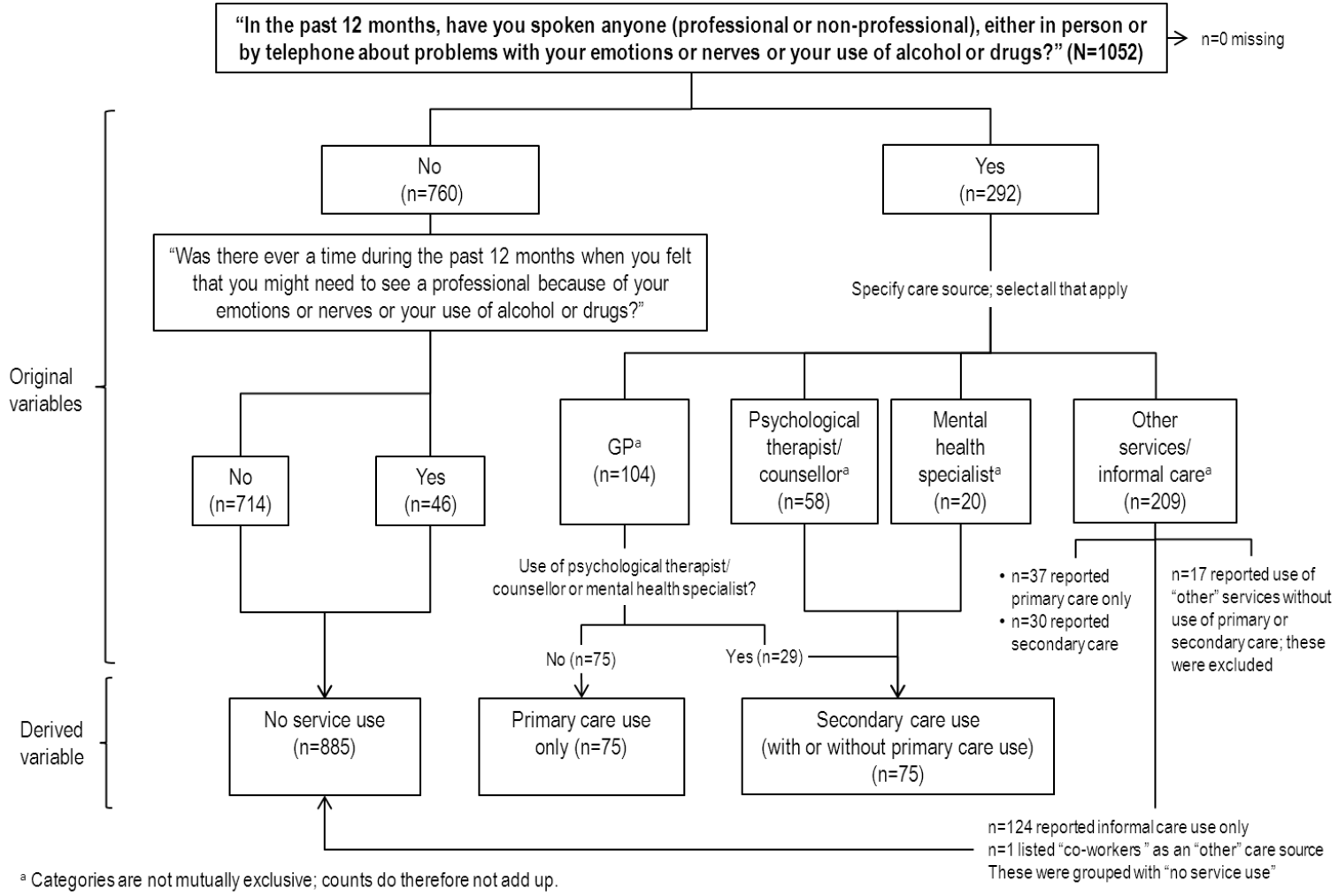



Figure 11 Derived variable of primary and secondary mental health service use in SELCoH 2

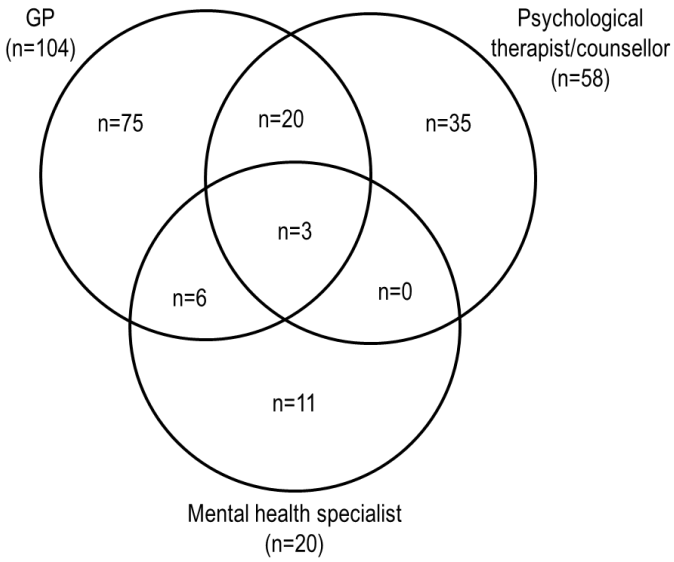



Figure 12 Overlap between different sources of mental health service use reported in SELCoH 2

#### 2.4.1.1 Mental health service use patterns (S1+S2)

A variable of MHSU patterns over time was created by cross tabulating the 2 derived S1 and S2 MHSU variables (Table 6). The MHSU patterns variable was composed of four categories: “no MHSU”, “discontinued MHSU”, “S2 initiated MHSU” and “persistent MHSU”. For the purposes of deriving the MHSU patterns variable, no distinction between primary or secondary care services was made. As all types of services were considered, the values which had previously been excluded due to ambiguous primary and secondary classification were re-introduced into the MHSU patterns variable. Thus, there were no missing values from the derived MHSU patterns variable.

Those who reported no use of services in the S1 and S2 measure were placed in the “no MHSU category”. Those reporting MHSU in S1, but no MHSU in S2 were grouped in the “discontinued MHSU” category. Conversely, those reporting MHSU in S2, but no MHSU in S1 were placed in the “S2 initiated MHSU” category. Finally, all who reported any type of MHSU both in S1 or S2 were placed in the “persistent MHSU” category.

Table 6 Derived variable of mental health service use patterns (S1+S2)

| **Mental health service use (S1)** | **Mental health service use (S2)** | | | | |
|---|---|---|---|---|---|
| | No MHSU | Primary MHSU only | Secondary MHSU | *Excluded*[a] | *Total n* |
| No MHSU | 785 | 38 | 32 | 11 | 866 |
| Primary MHSU only | 54 | 22 | 14 | 4 | 94 |
| Secondary MHSU | 40 | 15 | 27 | 2 | 84 |
| *Excluded*[a] | 5 | 0 | 2 | 1 | 8 |
| *Total n* | 844 | 75 | 75 | 18 | 1052 |

MHSU, mental health service use

[a] Excluded values are specified "other" professional services used for mental health reasons which could not be classified into primary or secondary care services. A full list of these services is shown in Table A3 in Appendix A.

- No MHSU
- Discontinued MHSU
- Initiated MHSU
- Persistent MHSU

### 2.4.2 Satisfaction

#### 2.4.2.1 Satisfaction (S1)

Those who reported MHSU in S1 were asked about their satisfaction with it: "In relation to 12-month service use (for mental health problems), were you satisfied?", providing yes/no answers. Those who reported dissatisfaction with care were asked to provide reasons for dissatisfaction. Response categories were:

- Doctor did not listen or ignored me
- Treatment was inappropriate
- Not given tests, treatment or hospitalisation which seemed important
- Doctor said there was nothing wrong or nothing they could do
- Could not communicate properly with the doctor
- Doctor did not understand me
- Other

These response options were made into binary variables.

#### 2.4.2.2 Satisfaction (S2)

In S2, all who endorsed care-receipt were asked about satisfaction with the care they received, whether from services or informal sources. The question specifically asked: “Considering all the contacts you had with a health professional in the past 12 months, overall, how satisfied were you with your visits?”. Response options were provided on a 5-point scale: “Satisfied”, “Somewhat satisfied”, “Neither satisfied nor dissatisfied”, “Somewhat dissatisfied” or “Dissatisfied”. In order to compose a comparable binary measure to that used in S1, “Satisfied”, “Somewhat satisfied” or “Neither satisfied nor dissatisfied” were grouped and compared against those who selected “Somewhat dissatisfied” or “Dissatisfied”.

Those who reported that they were “Somewhat dissatisfied” or “Dissatisfied” were asked about reasons for dissatisfaction, with response options that were equivalent to those in S1 (2.4.2.1). Binary variables were obtained from these responses.

Given that the question asking about service use in S2 was broader and included use of informal care sources, there were respondents answering satisfaction questions who had never made contact with services, but made use of informal services only. Analysis of the satisfaction questions was therefore limited to those who were placed in the derived “primary MHSU only” and the “secondary MHSU” categories. There were no missing data from the dissatisfaction measure among those in reporting “primary MHSU only” and “secondary MHSU”.

### 2.4.3 Quality indicators from the Quality Outcomes Framework (QOF)

Data from the QOF were used to obtain measures of mental health service quality in primary care. QOF is an opt-in pay-for-performance scheme for GPs in England [447]. It was introduced in 2004 aiming to standardise the quality of care delivered in the primary care sector and reduce inequalities in health [448]. QOF provides GPs financial rewards according to a points-based system for meeting achievement targets, routinely updating disease registers and

recording clinical information. This information contributes to a national database of practice-level quality indicators and disease registers, which is freely accessible to researchers and the public. QOF participation among UK surgeries is near all-encompassing: the combined practice list sizes provided by the 8305 practices participating in QOF 2009/2010 represented over 99% of all registered patients in England [449].

Points are awarded for practice achievement across 4 domains: clinical, organisational, patient experience, and additional services. The clinical domain is the largest, where points are awarded on the basis of achievement on indicators organised within specific clinical indicator sets. The diseases and disorders that are covered by the clinical indicators have been selected based on the availability of good evidence of health benefits likely to result from improved primary care. They include the most prevalent chronic physical conditions as well as severe mental illness (SMI) and depression. Points summed up across all disease domains produce a score of clinical achievement for each practice. Adding the total points of all 4 domains gives the total QOF achievement score for the practice.

All National Health Service (NHS) primary care practices in Southwark (N=52) and Lambeth (N=52) took part in QOF 2009/2010. Data from these practices were used for the purposes of deriving proxy measures of service quality. Data pertaining to the overall QOF achievement, clinical achievement, as well as achievement for the specific clinical indicators relating to mental health were used in this thesis.

#### 2.4.3.1 Overall achievement in QOF

A total of 1000 points were achievable across all 4 domains according to the 2009/2010 General Medical Services contract [450]. The points available in each domain were: 697.0 in the clinical domain, 167.5 in the organisational domain, 91.5 in the patient experience domain, and 44.0 in additional services. The organisational domain rewards good record keeping practice, information provided to patients, education and training for staff, having appropriate procedures and practices in place and good management of medicines. The patient experience domain considers the length of consultations and access in terms of booking appointments. The points from the additional services domain

are awarded according to clinical indicators that apply to practices providing the following services: cervical screening, child health surveillance, maternity services and contraception. The process of delivering points in the clinical domain is described in detail below.

#### 2.4.3.2 The clinical domain

Points in the clinical domain are delivered based on the performance on a number of clinical indicators. The clinical indicators include producing up-to-date patient registers, delivering various tests and procedures and achieving certain clinical outcomes. There were a total of 86 clinical indicators distributed across 20 clinical indicator sets in QOF 2009/2010. The number of indicators per set varied from 1 to 17. The list below shows the clinical indicator sets and the number of indicators within each set in brackets [449]:

- Coronary heart disease (10 indicators)
- Cardio-vascular disease (primary prevention) (2)
- Heart failure (4)
- Stroke and transient ischaemic attack (8)
- Hypertension (3)
- Diabetes mellitus (17)
- Chronic obstructive pulmonary disease (5)
- Epilepsy (4)
- Hypothyroidism (2)
- Cancer (2)
- Palliative care (2)
- Mental Health (6)
- Asthma (4)
- Dementia (2)
- Depression (3)
- Chronic kidney disease (5)
- Atrial fibrillation (3)
- Obesity (1)
- Learning disabilities (1)
- Smoking (2)

The number of points awarded for achievement on an indicator varies within and between clinical indicator sets. For example, in QOF 2009/2010 4 points were awarded for keeping a register of adults with learning disabilities, while 6 points were awarded for keeping a register of adult patients with diabetes. Within the diabetes indicator set, 3 points were awarded for recording a blood pressure measure for a set proportion of registered diabetes patients in the past 15 months, while up to 18 points may be awarded according to the proportion of diabetes patients with a blood pressure reading of 145/85 or less.

For most clinical indicators (79% in 2009/2010) points are incrementally awarded according to the proportion of patients on a register achieving the given indicator, within a set range. These are referred to as payment stages. For example, within the hypertension set, up to 18 points were available for measuring blood pressure in the previous 9 months for patients on the hypertension register. Points for this particular indicator were proportionately awarded if 40-90% of patients on the hypertension register have a record of their blood pressure within the set time frame. Thus, no points were gained if less than 40% of hypertension patients have achieved this indicator; 9 points were awarded for 65% achievement, and no more than 18 points were awarded for achievement above 90%.

#### 2.4.3.3 Clinical indicators related to mental health

Of the 20 clinical indicator sets within the clinical domain in QOF 2009/2010, 2 sets related to mental health. These were “mental health” (referring to SMIs) and “depression”. The clinical indicators contributing to these sets are shown in Table 7. In 2009/2010 the achievement for the “mental health” and depression indicator sets was lower compared to other indicator sets. The average national achievement for the sets were below the lowest quartile for overall achievement, and depression had the lowest achievement of all clinical indicator sets (81.7% achievement, compared to a median of 97.9%) [449].

Table 7 Clinical indicators related to mental health in QOF 2009/2010

| | *Points* | *Payment stages* |
|---|---|---|
| **Mental health (MH)** | | |
| ***Records*** | | |
| MH 8. The practice can produce a register of people with schizophrenia, bipolar disorder and other psychoses | 4 | |
| ***Ongoing management*** | | |
| MH 9. The percentage of patients with schizophrenia, bipolar affective disorder and other psychoses with a review recorded in the preceding 15 months. In the review there should be evidence that the patient has been offered routine health promotion and prevention advice appropriate to their age, gender and health status | 23 | 40-90% |
| MH 4. The percentage of patients on lithium therapy with a record of serum creatinine and TSH in the preceding 15 months | 1 | 40-90% |
| MH 5. The percentage of patients on lithium therapy with a record of lithium levels in the therapeutic range within the previous 6 months | 2 | 40-90% |
| MH 6. The percentage of patients on the register who have a comprehensive care plan documented in the records agreed between individuals their family and/or carers as appropriate | 6 | 25-50% |
| MH 7. The percentage of patients with schizophrenia bipolar affective disorder and other psychoses who do not attend the practice for their annual review who are identified and followed up by the practice team within 14 days of non-attendance | 3 | 40-90% |
| **Depression (DEP)** | | |
| ***Records*** | | |
| DEP 1. The percentage of patients on the diabetes register and /or the CHD register for whom case finding for depression has been undertaken on one occasion during the previous 15 months using two standard screening questions | 8 | 40-90% |
| DEP 2. In those patients with a new diagnosis of depression, recorded between the preceding 1 April to 31 March, the percentage of patients who have had an assessment of severity at the outset of treatment using an assessment tool validated for use in primary care | 25 | 40-90% |
| DEP 3. In those patients with a new diagnosis of depression and assessment of severity recorded between the preceding 1 April to 31 March, the percentage of patients who have had a further assessment of severity 5-12 weeks (inclusive) after the initial recording of the assessment of severity. Both assessments should be completed using an assessment tool validated for use in primary care | 20 | 40-90% |

Source: NHS Employers & General Practitioners Committee [450]

#### 2.4.3.4 Applying QOF 2009/2010 data to SELCoH

1490 (88%) of S1 respondents consented to provide information about their primary care practice. Information on the name and address of the practice and/or the name of the GP allowed allocating the consenting S1 respondents to primary care practices, enabling linking the QOF data for these practices to SELCoH 1. I was able to allocate 80% (n=1197) of the consenting respondents to a Southwark or Lambeth surgery (Table 8). A further 3.4% were attributable to a surgery within the catchment area, but incomplete information meant that allocation could not be made with certainty. The majority of the remaining respondents were registered with a practice outside the catchment area, had provided insufficient information in order to make surgery allocation possible, or never provided the practice details. One person withdrew their data after initial consent, and 2 persons who were registered with non-NHS practices were excluded (a private practice, and a specialist mental health service for military veterans).

Using the surgery information, QOF 2009/2010 data for the 104 practices in Southwark (N=52) and Lambeth (N=52) were linked to the 1197 respondents in the SELCoH 1 dataset. There were 2 practices in Southwark (Dr Dewji and Dr Lee) and 2 practices in Lambeth (Dr Irani and The Vale Surgery (Dr Ramanan)) where no SELCoH 1 respondents were registered. Thus QOF data from a total of 100 surgeries (50 in Lambeth, 50 in Southwark) were linked to the SELCoH 1 dataset.

Table 8 Surgery allocation of consenting SELCoH 1 respondents by borough and reasons for non-allocation **(**N=1490)

| | n | % |
|---|---|---|
| **Allocated** | 1197 | 80.3 |
| Southwark | 560 | 37.6 |
| Lambeth | 637 | 42.8 |
| **Non-allocated** | 259 | 19.7 |
| Surgery attributable to Southwark, precise surgery allocation not possible | 30 | 2.0 |
| Surgery attributable to Lambeth, precise surgery allocation not possible | 28 | 1.9 |
| Surgery located in London, outside Southwark/Lambeth | 118 | 7.9 |
| Surgery located outside London | 47 | 3.2 |
| Not possible to identify practice based on surgery information provided | 9 | 0.6 |
| GP contact consented, but no practice information recorded | 45 | 3.0 |
| No practice information given (“don't know / can't remember / will give details later”) | 13 | 0.9 |
| Withdrew GP data after initial consent | 1 | 0.1 |
| Non-NHS practice | 2 | 0.1 |

Counts and percentages are unweighted.

#### 2.4.3.5 Deriving quality measures

Data for all the 8305 practices participating in QOF 2009/2010 were used in order to produce national tertiles for the total QOF score, overall clinical achievement and different sets of clinical indicators related to mental health. These were then applied to the linked QOF data in SELCoH 1, deriving categorical variables by grouping the Southwark and Lambeth practices into low, moderate and high quality according to the national tertiles.

##### 2.4.3.5.1 Total QOF achievement

In order to generate national tertiles of the total QOF achievement, the scores for all practices in England were split into tertiles. The cut-offs were: 0-934.59, 934.60-964.99, and 965.00-1000. These boundaries were then applied to the linked QOF data in SELCoH 1, dividing the practices into categories of low, moderate and high overall quality.

#### 2.4.3.5.2 Overall clinical achievement

The variables using data from the clinical domain were based on achievement (proportion of eligible patients achieving indicators) rather than points delivered. This approach provided measures with greater variation and also meant that the clinical indicators were weighted equally. A minority of indicators (n=18) were not measured according to proportions of patient achievement (e.g. keeping patient registers) and were excluded. Thus, the achievement of a total of 68 clinical indicators contributed to the variable of overall clinical achievement. Their distribution across the different clinical areas was the following (number of indicators in brackets):

- Coronary heart disease (9)
- Cardio-vascular disease (primary prevention) (2)
- Heart failure (3)
- Stroke and transient ischaemic attack (7)
- Hypertension (2)
- Diabetes mellitus (16)
- Chronic obstructive pulmonary disease (4)
- Epilepsy (3)
- Hypothyroidism (1)
- Cancer (1)
- Palliative care (0)
- Mental Health (5)
- Asthma (3)
- Dementia (1)
- Depression (3)
- Chronic kidney disease (4)
- Atrial fibrillation (2)
- Obesity (0)
- Learning disabilities (0)
- Smoking (2)

The achievement for each of these clinical indicators was thus defined as the proportion of eligible patients achieving the given indicator (excluding the exception reported from the denominator), irrespective of where these stood in relation to payment stages. The mean achievement for all 68 indicators across all indicator sets was estimated. This provided a total clinical achievement score ranging from 0-1 for each practice. The scores for all England practices were then split into tertiles. These informed the cut-points which were applied to the clinical achievement of the Southwark and Lambeth practices. This generated a three-categorical variable of low, moderate and high clinical achievement.

2.4.3.5.3 Mental health and depression achievement

A similar process was applied to the subset of clinical indicators relevant to mental health (Table 7) in order to obtain mental health quality variables. Thus, with the exception for MH8 (concerned with producing patient registers), the mean achievement of these indicators was estimated for all England practices, and split into tertiles. These informed the boundaries applied to the categorical variable of mental health service quality (low, moderate and high) of the Southwark and Lambeth practices. These steps were repeated to produce separate variables of quality for the “mental health” and “depression” sets. Finally, the DEP1 indicator (Table 7), specifically relating to mental-physical comorbidity, was also examined separately. Similar to the process of deriving the other quality variables, the national achievement of this indicator was grouped into tertiles which informed the boundaries of the categorical variable applied to the QOF data linked to the SELCoH dataset.

## 2.5 Socio-demographic indicators

All socio-demographic indicators were obtained from the SELCoH 1 phase.

### 2.5.1 Gender (S1)

The respondent's gender was recorded as male or female. There were no missing data for this variable.

### 2.5.2 Age (S1)

Age was ascertained at three points throughout the interview. The age of the respondent was first asked in the opening section of the interview, as part of a contact information sheet. It was later captured in the interview by the 2 questions: "*What is your date of birth?*" and "*What was your age on your last birthday?*".

There were 72 discrepancies between the age ascertained in the contact information sheet and the age ascertained in the interview, most of which were small (42 were ±1 year). Discrepancies were resolved by contrasting the day of the interview with the reported date of birth. For 1 case where date of birth information was missing, the mean between the contrasting ages was used.

Age was categorised into five groups for use as an independent variable of interest (16-29, 30-39, 40-49, 50-59, 60 or over). Age was also used as a continuous measure in analyses where it was conceptualised as an explanatory factor. The age measure had no missing data.

### 2.5.3 Relationship status (S1)

Six categories of relationship status were captured. These were single and never married; single and living with partner; married and living with spouse; married and separated from spouse; divorced; and widowed. Those who were living with partners (married or single) were grouped together to a "married/cohabitating" group, and those who were married-and-separated or divorced were grouped together. Preliminary analyses indicated small cell counts for the widowed group by the outcome variables. It was therefore also grouped with the separated and divorced, generating a category of "previously in relationship". A three-group variable was thus produced, distinguishing

between married/cohabitating, single and previously in relationship. The measure had no missing data.

### 2.5.4 Ethnicity (S1)

The item measuring ethnicity asked: "*To which of the following groups do you consider you belong?*" Respondents identified their ethnic group by selecting a category from a list of White, Black Caribbean, Black African, Other Black groups, Indian, Pakistani, Bangladeshi, and Chinese, which were broadly consistent with categories used in the 2001 and 2011 Censuses [51, 446]. If none of these categories applied they could select "other", and were given an opportunity to specify the ethnic group they identified with. Due to small cell counts respondents of self-identified Indian (n=34), Pakistani (n=20), Bangladeshi (n=9), Other Black (n=30) and Chinese (n=22) ethnicity were grouped in the "other" category. Two respondents refused to answer the question measuring ethnicity.

### 2.5.5 Migrant status (S1)

Migrant status was indicated by measure of self-reported birthplace and length of stay in the UK (Figure 13). Respondents who reported Britain, UK, England, Wales, Scotland or Northern Ireland as their birthplace were coded as non-migrants; those reporting any other birthplace were categorised as migrants. Twenty-nine respondents were not asked this question because the measure was introduced at after the recruitment process had started.

The length of stay measure was used to further categorise migrants into groups of 0-4, 5-9 and ≥10 years of residing in the UK. These categories were informed by previous studies examining migrant health using the SELCoH sample [258]. However, preliminary analyses indicated that cell counts were small in the 0-4 and 5-9 year groups when cross-tabulated against outcome variables. The 10 -year, rather than the five-year, cut-off was therefore used.

Four respondents who were coded as migrants (birthplace: Ireland) did not report length of stay in the UK as this item had been coded as non-applicable. These were therefore coded as missing. An additional 3 of those who were initially coded as migrants had "true missing" data for the length of stay measure, and were also coded as missing.

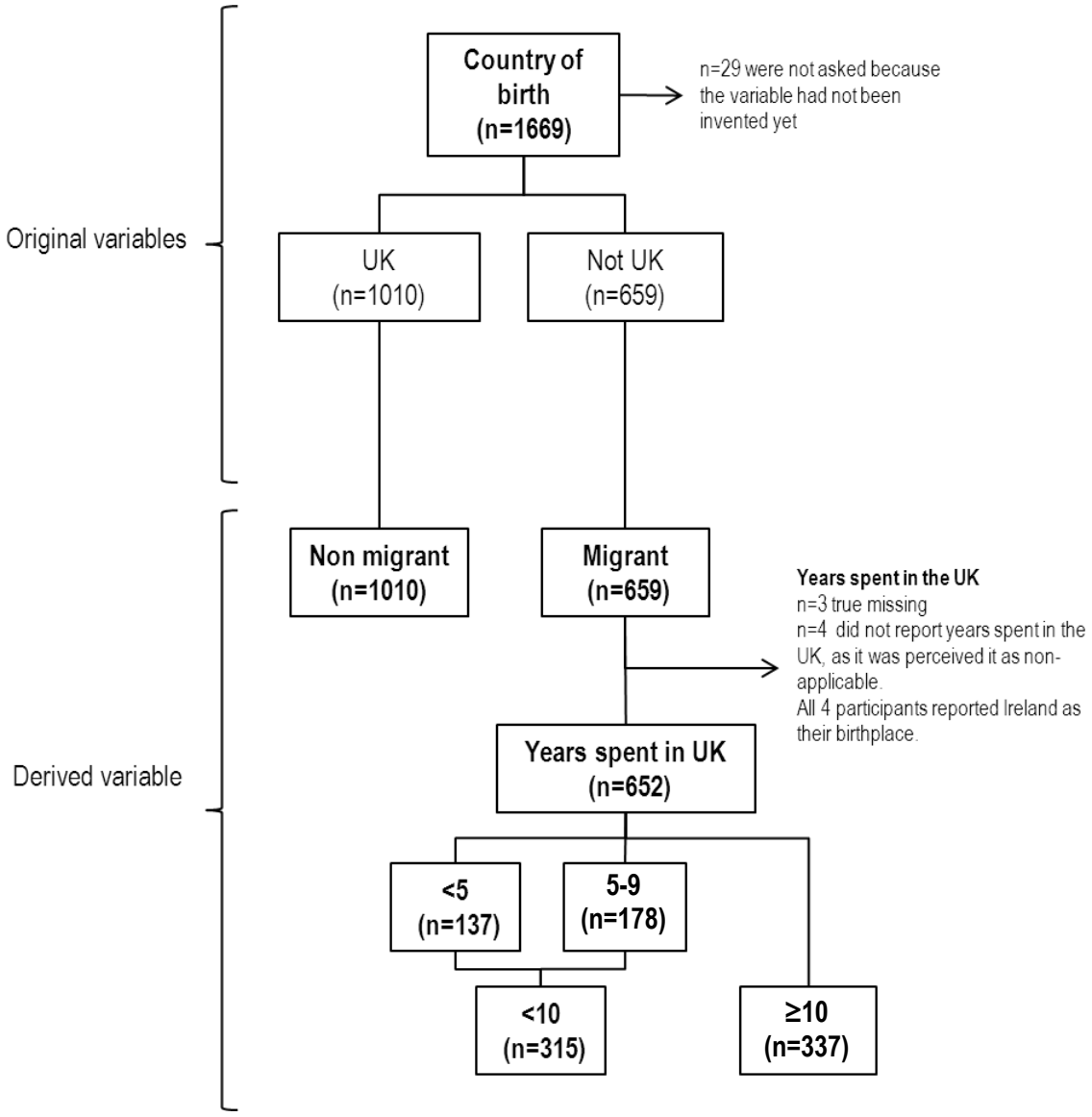



Figure 13 Migrant variable (S1)

## 2.6 Socio-economic indicators

A broad range of socio-economic indicators were obtained from the S1 and S2 surveys. S1 measures of SES were used in cross-sectional analyses, while SES measures composed of S1 and S2 indicators were used in longitudinal analyses to capture SES over time.

### 2.6.1 Education

#### 2.6.1.1 Education (S1)

Educational attainment was measured by asking respondents to report the educational qualifications they had obtained, by selecting all that applied from a list. These were no qualifications; “below GCSE level qualifications”, “GCSE or equivalent (Ordinary Level, NVQ 1-2)”, “Advanced level (A-level) qualifications or equivalent (HNDs, NVQ level 3, Highers)”, or “degree qualifications or above”. A flowchart illustrating the categorisation process is outlined in Figure 11. A small number of respondents reported qualifications below GCSE (n=60), and were grouped with no qualifications. There were a total of 19 missing values from the S1 education variable: 8 true missing from all education categories, 6 were true missing from the variable specifying “other”, and 5 of the “other” specified qualifications could not be classified.

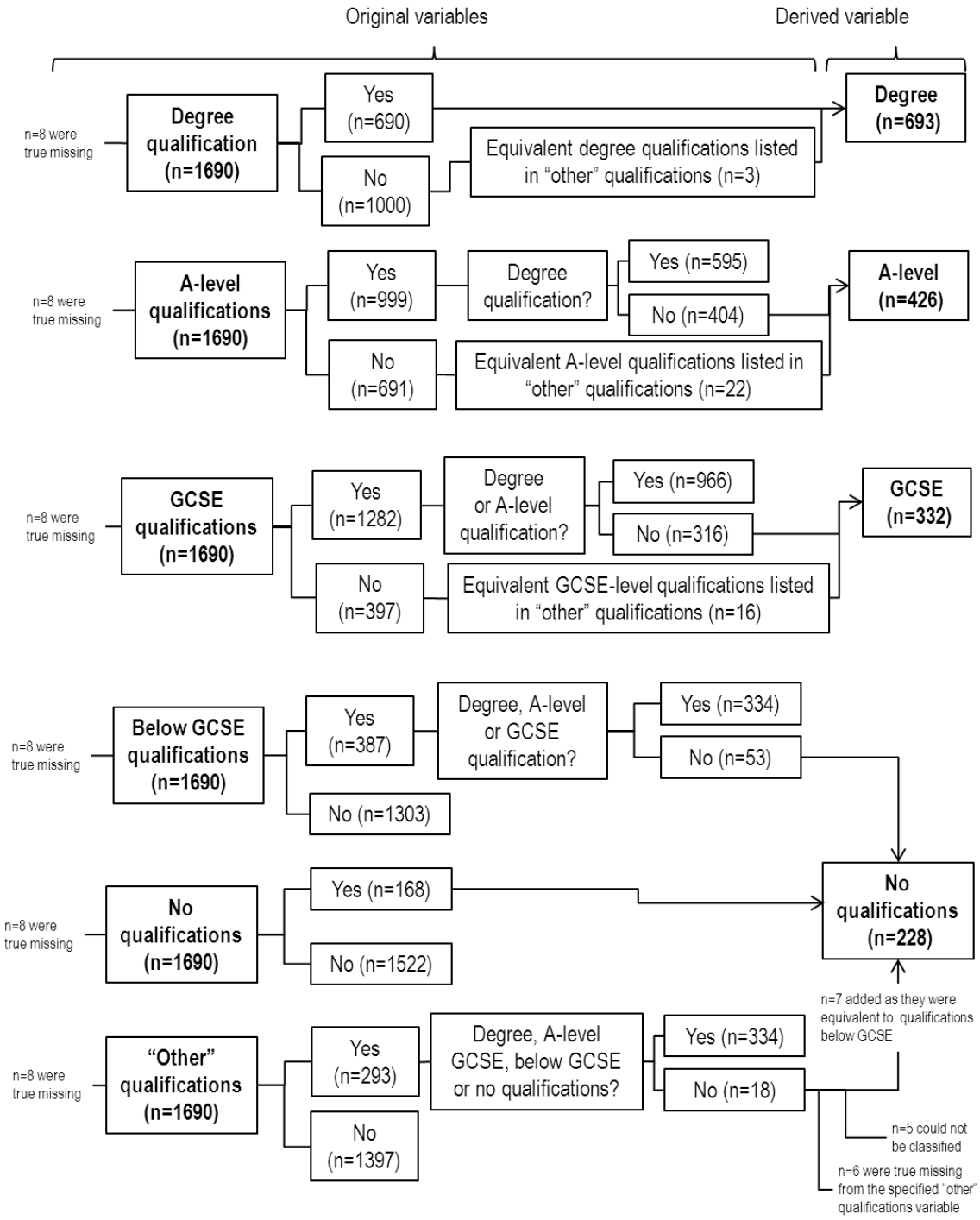



Figure 14 Education variable (S1)

#### 2.6.1.2 Education (S2)

The S2 education measure was broadly similar to the S1 measure, with a few modifications. The variable was thus recoded, to make it comparable to the S1 education variable (shown in Figure 15). The education measure in S2 included the categories: “no qualifications”, “below GCSE qualifications”, “GCSE or equivalent (Ordinary Level, NVQ 1-2)”, “Advanced level (A-level) qualifications or equivalent (HNDs, NVQ level 3, Highers)”, “higher (undergraduate)”, “higher (postgraduate)”, “vocational”, and “other”. The “below GCSE qualifications” was collapsed with the “no qualifications” group, and the 2 higher education categories were collapsed, generating a “degree or above” category.

Five respondents reported “other qualifications”. These were re-coded into the appropriate categories, according to their specified qualification: three persons with vocational qualifications (“music teaching”, “armed forces qualification” and “RAF education”) were placed in the vocational category, and 1 respondent with higher education qualifications (“doctor”) was grouped with the “degree or higher” category. Data specifying the “other” qualification were missing for 1 respondent due to equipment failure. This person was recoded to “degree or above”, informed by the qualification reported in S1.

In order to make the variable comparable to the S1 education variable the vocational group were recoded into the, “GCSE qualifications”, “A-level qualifications” or “degree qualifications or above” according to the level of education indicated in S1. Those who reported “no qualifications” in S1 were recoded into GCSE qualifications in S2, as was 1 respondent for whom data were true missing from S1.

Comparisons with the S1 education variable indicated that 7.3% (n=77) of the S2 respondents reported a lower level of education in S2 than in S1. These were recoded such that they were at the same level of education as reported in S1. The S2 education variable thus represented the highest education level reported at either timepoint. The final education variable contained no missing data.

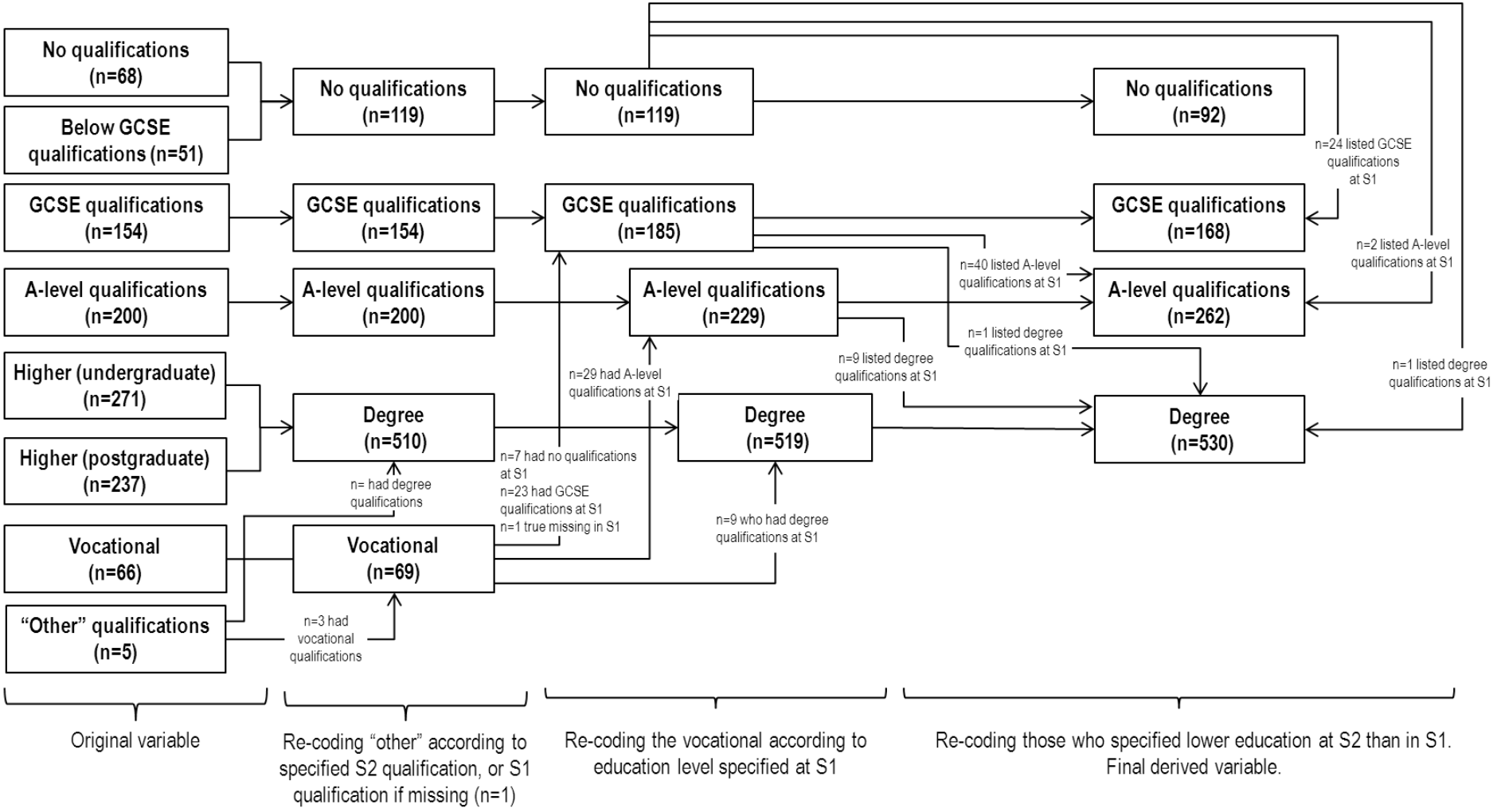



Figure 15 Education variable (S2)

### 2.6.1 Employment

#### 2.6.1.1 Employment (S1)

Employment was ascertained by asking respondents to select from a list the description that best fitted their current work status. The options were: full-time work, part-time work, casual work, student (not working), student working part-time (≤35h per week), student working full-time (>35h per week), unemployed, temporary sick leave, permanent sick/disability leave, retired, looking after the home with children under the age of 16, and looking after the home with children aged 16 or over. The measure was re-categorised to improve distribution of the variable and circumvent collinearity with other variables in subsequent analyses (e.g. sick/disabled with the comorbidity variable, retired with age). The re-categorised variable collapsed the categories into working (full-time, part-time, casually, full-time and part-time working students, or temporarily off work due to illness), not working (unemployed, permanently off work due to illness or disability, retired, or looking after children at home over and under the age of 16), and (non-working) students. This categorisation was informed by the literature evidencing the health benefits of work [318]. There were 9 true missing from this measure.

#### 2.6.1.2 Employment (S1+S2)

The S2 employment measure was used in combination with the S1 employment measure to generate 2 separate variables of employment/education trajectories and employment adversity. The S2 employment measure asked about current employment status and provided similar response options to the S1: full-time work, part-time work, casual work, student (not working), working student, unemployed (looking for work), unemployed (not looking for work), temporary sick leave, permanent sick/disability leave, retired, looking after kids, not working outside the home. One of the 1052 S2 respondents refused to answer the question.

##### 2.6.1.2.1 Employment/education trajectories (S1+S2)

A four-categorical variable of employment/education trajectories among those of working age was derived by cross-tabulating employment at S1 and S2 (Table 9). This variable was created in order to be used as an outcome variable in

Chapter 5, examining the impact of comorbidity on employment trajectories. For the purposes of creating the derived employment/education trajectories variable, employment was broadly classified as “in” or “out” of employment/education. “In education/employment” included those who reported either being employed (full-time employed, part-time employed, casual work, working students, or on temporary sick leave) or non-working students. “Out of education/employment” included those who were unemployed, permanently sick/disabled, in caring roles, or reported early retirement. According to this binary classification four broad employment transition groups were derived: 1) stable employment/education, 2) transitions into employment/education, 3) transitions out of employment/education, and 4) persistently out of employment/education.

Consistent with previous research on health and employment trajectories [451–454], the variable was restricted to respondents of working age (16-65 at S2), excluding 129 respondents (12.3% of the S2 sample). In the UK, retirement was compulsory at the age of 65 until April 2011. There is no longer a compulsory retirement age dictated by the Government, but is now determined by employers [455].

Of the 923 S2 respondents younger than 65, there were 5 missing employment values: 4 were true missing from the S1 measure (employed (n=2), carer (n=1), and retired (n=1) at S2), and 1 respondent refused to respond at S2 (unemployed at S1).

Table 9 Transitions of employment and education from S1 to S2

| | **Employment (S2)** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Employment (S1)** | Employed[a] | Student | Unemployed | Sick/ disabled | Carer | Early retirement (<65) | *Total n* |
| Employed[a] | 535 | 13 | 35 | 7 | 15 | 7 | 612 |
| Student | 52 | 41 | 18 | 0 | 7 | 0 | 118 |
| Unemployed | 31 | 8 | 28 | 5 | 10 | 5 | 87 |
| Sick/disabled | 0 | 0 | 5 | 22 | 0 | 7 | 34 |
| Carer | 12 | 2 | 9 | 3 | 20 | 0 | 46 |
| Early retirement (<65) | 3 | 0 | 0 | 0 | 0 | 18 | 21 |
| *Total n* | 613 | 84 | 95 | 37 | 52 | 37 | 918 |

[a] "Employed" includes those in full-time employment, part-time employment, casual work, working students, and those reporting temporary sick leave.

- Stable education/employment (n=641)
- Transitions into education/employment (n=56)
- Transitions out of education/employment (n=89)
- Persistently out of education/employment (n=132)

#### 2.6.1.2.2 Employment adversity (S1+S2)

A binary variable of employment adversity was created by collapsing the categories of the employment/education trajectory variable described above in section 2.6.1.2.1. This variable was used as an explanatory factor in longitudinal analyses. The stable employment/education category and the transitions into employment/education category were collapsed and considered as “non-adverse” employment conditions, while the transitions out of employment/education category and the persistently out of employment/education category were collapsed and considered “adverse” employment conditions.

The previously excluded 129 respondents aged over 65 were re-introduced in the employment adversity variable and grouped with the non-adverse employment conditions category. Whilst work may be beneficial to those over 65, the norm for this age group is retirement. The employment transitions into retirement may thus not necessarily be considered adverse for this group, nor is continuous retirement. Of the re-introduced respondents over 65 most (73.1%; n=93) reported that they were retired at both timepoints, while 17.1% (n=22) reported that they were employed at both timepoints. The remaining respondents transitioned from employment (5.4%; n=7), unemployment (1.6; n=2) and permanent sick/disability (3.2%; n=3), into retirement; and another 2 persons (1.6%) reported a transition from retirement at S1 into employment at S2.

There were no additional missing values to the 5 that were missing from the employment/education trajectory variable, outlined above.

### 2.6.2 Household income

#### 2.6.2.1 Household income (S1)

The household income measure asked respondents to indicate their gross weekly household income from all sources before any deductions by selecting from five categories. These were: £0-105, £106-232, £233-398, £399-604, £605 or more. For each category, equivalent annual and monthly estimates were provided, to facilitate identification of the most appropriate income category. For ease of interpretation, the annual income estimates were used to label the variable categories (£0-5,475, £5,476-12,097, £12,098-20,753, £20,754-31,494, £31,495 or more).

There were true missing data for 22 respondents, 1 respondent refused to answer the question, and 239 did not know the income of the household and were coded as missing. Compared to those who reported income, those who did not know the household income were mostly younger and students or unemployed (data not shown).

#### 2.6.2.1 Household income (S1+S2)

As in S1, the S2 measure of household income asked about gross income from all sources, allowing respondents select from pre-specified categories. These were labelled with equivalent weekly, monthly and annual boundaries. The categories of the S2 measure were identical to four of the five categories of the S1 measure (annual income categories: £0-5,475, £5,476-12,097, £12,098-20,753, and £20,754-31,494). In contrast to the S1 measure which only contained higher income category (£31,495 or more), the S2 measure distinguished between an additional five levels of income (£31,495-42,235, £42,236-52,976, £52,977-63,717, £63,718-74,458, £74,459 or more). For consistency with the S1 variable these additional S2 categories were collapsed into a single category of £31,495 or more.

The missing data from the S2 income variable consisted of 2 persons who reported the household income question as inapplicable, 9 persons who refused to respond, and 93 respondents who reported that they did not know their household income. The persons reporting that not knowing their household

income at S2 were similar to those reporting not knowing at S1 in terms a greater proportion being younger and students, but greater proportions of older age groups and retired persons also reported not knowing their household income (data not shown).

The S1 and S2 variables of annual household income were jointly considered in order to inform a binary variable of low household income. This grouped those with persistently low income, those who transitioned into low income or reported a sharp decline in income. Those who reported either of the 2 lowest income categories (£0-5,475, £5,476-12,097) at S1 and S2 were considered having persistently low income. Those who moved from either of the three higher household income groups (£12,098-20,753, £20,754-31,494, £31,495 or more) at S1 into the 2 lower income categories at S2 were grouped with those with persistently low income. A drop from the highest income category, (£31,495 or more) to the middle income category (£12,098-20,753) was considered a sharp decline in household income. Those who reported such income declines were also grouped with those reporting persistently low income or transitions into low income.

Data for the low income variable were available for 80.1% (n=849) of the 1052 S2 respondents. Most missing data were due to respondents reporting that they did not know the household income either at S1 or S2 (191 of the 203 missing).

### 2.6.3 Debt

#### 2.6.3.1 Debt (S1)

Debt was measured by asking respondents whether they had been "*seriously behind*" on any payments in the past year, including: rent, utility bills, goods or hire purchase, mortgage repayments, council tax, credit card payments, telephone, or other loans. A binary variable of "any debt" *vs* "no debt" was created from this measure. For 19 respondents, data on debt were true missing, and 1 respondent refused to answer the question.

#### 2.6.3.1 Chronic debt (S1+S2)

The debt measure in the S2 survey was identical to the S1 measure of debt, with the exception of substituting "telephone" for "mobile phone" in the list of

possible late payments. A comparable S2 debt measure to that in S1 contrasted those reporting any debt and against those reporting no debt. There were no missing data from the S2 debt measure.

A binary composite variable of chronic debt grouped those who reported debt at both timepoints in comparison to all others. This variable had missing data for 13 respondents, due to true missing data from the S1 measure.

### 2.6.4 Benefits receipt

#### 2.6.4.1 Benefits receipt (S1)

Benefits receipt was measured by respondents indicating which, if any, benefits they currently received from a provided list of benefit types. Given that the analyses in this thesis used mental and physical health as exposure or outcome variables, health related benefits were excluded from analyses to avoid inflated associations due to collinearity. These were: Incapacity Benefit, Disability Living Allowance, Industrial Injury Disability Benefit, Disability Working Allowance, and Statutory Sick Pay. The remaining benefit types contributing to a binary variable of "any benefits" *vs* "no benefits" included: Jobseeker's Support Allowance, Income Support Allowance, Family/Working Families Tax Credit and "other" benefits. There were 8 true missing data points.

#### 2.6.4.1 Benefits receipt (S1+S2)

Similar to the S1 survey, the benefits receipt item asked which, if any, benefits they currently received in their own right, by selecting all that applied from a provided list of benefits. As with the S1 measure benefits related to health (listed in 2.6.4.1 above) were excluded. The non-health related benefit types which contributed to the binary S2 variable of benefits receipt included: Jobseeker's Allowance, Income Support Allowance, Family/Working Families Tax Credit and selected benefits from those specified in indicating the receipt of "other" benefits.

In contrast to the S1 measure, those who indicated the receipt of "other" benefits in the S2 measure were given an opportunity to specify which benefits they received. These were screened for inclusion in the non-health related benefits category among those who has not already been included in the

category by selecting any of the pre-specified benefits. Eight of 24 who indicated receipt of “other” benefit types were included in the non-health-related benefits category (Asylum Support (n=1), Carers Allowance (n=2), Council Tax Benefit (n=1), Education Maintenance Allowance (n=2), Tax Benefit (n=1), Tenant Allowance (n=1)).

The remaining 16 respondents who indicated the receipt of “other” benefits were not recoded to receiving benefits on the grounds that they were related to health (Attendance Allowance (n=3), “High Reduced Mobility” (n=1)), that they were not necessarily indicative of social adversity (Child Benefit (n=5), Child Tax Credit (n=1), Heating Allowance (n=1), Pension (n=2), Private Insurance (n=1)) or because data specifying the benefit types were missing (n=2). There were no missing data from the S2 non-health related benefits variable.

In order to develop a variable that represented benefits receipt across both timepoints, a binary variable was composed by contrasting those who reported benefits receipt at S1 and/or S2 against those who did not report benefits receipt at either timepoint. There were true missing data for 6 respondents from the composite S1+S2 non-health related benefits receipt variable, due to true missing data from the S1 benefits receipt measure.

### 2.6.5 Social class

In the S1 survey, respondents were asked about their current job title, and responses were recorded per verbatim. These data were intended to be used in order to generate a social class variable by categorising the job titles according to the six categories of the Registrar General’s classification [306]: professional (I), managerial/technical (II), skilled nonmanual (III-NM), skilled manual (III-M), semi-skilled (IV) and unskilled (V). However, 48.8% (N=768) of the sample were not in current employment (e.g. students, unemployed, retired) and respondents in this group were not asked about their most recent employment. As a result, a social class could not be attributed to a large proportion of the S1 sample, and the occupational social class variable was therefore not used, as the employment variable better captured the social status of among those out of work.

Although the measures of social class were improved to address these limitations in S2, the lack information for social class in S1 did not allow for the

construction of a variable that accurately captured social class over time. S2 information regarding social class was therefore also not used.

## 2.7 Health and service use related measures

Throughout this thesis, the health and service use related indicators have been used as either explanatory factors or mediators.

### 2.7.1 Poor health behaviours (S1)

In SELCoH 1, a composite variable of poor health behaviours was derived using measures of hazardous alcohol use and smoking status. Although exercise is commonly considered a health behaviour, it was not included as an explanatory factor given that measures of exercise could be influenced by physical health and disability itself. This may be particularly true for older persons with limiting health conditions such as arthritis.

Alcohol consumption was measured by the Alcohol Use Disorders Identification Test (AUDIT) [456]. The AUDIT consists of 10 questions about alcohol consumption, misuse and dependence in the past 12 months. Scores from each question, ranging from 0 to 4, are added up, producing a total score ranging from 0-40. An AUDIT score of eight or more indicates hazardous alcohol use, and was used to generate a binary variable. From the final variable there were 6 missing due to refusal to respond, and 5 true missing.

A binary current smoking measure was obtained from a single item question asking: “Do you smoke cigarettes at all nowadays?”. This was a follow-up question asked only to respondents who endorsed ever smoking regularly in their lifetime. Thus, 812 persons were not asked the question, of which 514 persons reported never smoking a cigarette and 298 reported lifetime smoking but never smoking regularly. Ten refused to respond to this item, and 3 were true missing.

The alcohol and smoking variables were cross-tabulated to create a single variable of poor health behaviours with three categories (Table 10). The categories were: “neither smoking nor hazardous alcohol use”, “either smoking *or* hazardous alcohol use”, and “smoking *and* hazardous alcohol use”. Missing values from either measure were coded as missing from the derived variable, producing a total of 17 missing: 10 due to refusal to respond and 7 true missing. The poor health behaviours variable was used as an explanatory factor in cross-sectional analyses.

Table 10 Derived variable of poor health behaviours (S1)

| **Hazardous alcohol use (S1)** | **Current smoking (S1)** | | | | | | ***Total n*** |
|---|---|---|---|---|---|---|---|
| | Never smoked a cigarette | Never a regular smoker | Not currently smoking | Currently smoking | *Refused to respond* | *True missing* | |
| No hazardous alcohol use | 481 | 233 | 352 | 272 | 4 | 2 | 1344 |
| Hazardous alcohol use | 32 | 64 | 98 | 149 | 0 | 0 | 343 |
| *Refused to respond* | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| *True missing* | 1 | 1 | 0 | 2 | 0 | 1 | 5 |
| ***Total n*** | 514 | 298 | 450 | 423 | 10 | 3 | 1698 |

Shaded cells were included in the derived variable, total cell count=1681. Non-shaded cells were coded as missing (n=17).

- Neither smoking nor hazardous alcohol use (n=1066)
- Either smoking or hazardous alcohol use (n=466)
- Smoking and hazardous alcohol use (n=149)

### 2.7.2 Somatic symptom severity

#### 2.7.2.1 Somatic symptom severity (S1)

The Patient Health Questionnaire somatic symptom severity scale (PHQ-15) [457] was used as an indicator of somatic severity. The PHQ-15 asks to what extent each of 15 different somatic symptoms has bothered the respondent over the past 4 weeks (e.g. stomach pain, dizziness, shortness of breath). Each symptom is scored on a 3-point scale: “not bothered at all” (0), “bothered a little” (1) or “bothered a lot” (2). The points are then added up to produce a total symptom score ranging from 0-30. One item in the questionnaire asks about “menstrual cramps or problems with your period”. For the purposes of the analyses in this thesis, this item was excluded, as it was only applicable to women. Thus, the total achievable score in this study was 28, rather than 30.

There were 110 respondents who had missing values on at least 1 of the 14 applicable somatic symptoms. These were mostly due to rating the item “pain or problems during sexual intercourse” as inapplicable. These were coded as 0 for the purposes of producing a count variable. After this recoding there were another 36 who had missing items on at least 1 of the 14 symptoms. Of these, 11 were coded as missing on the total symptom score: 6 refused to respond to

all items, 4 had true missing values on all items; and 1 person refused to respond to 2 items and had true missing values for another 3 items. The remaining 25 respondents had true missing values on 1, 2, or 3 of the 14 PHQ items. These missing values were not systematically distributed according to any cluster of somatic symptoms. These respondents were given a score based on the non-missing PHQ-15 items, as it was considered preferable to produce a conservative total score for these respondents rather than coding them as missing altogether.

The recommended cut points for the PHQ-15 are <5, 5-9, 10-14 and ≥15, representing minimal, low, moderate, and high somatic symptom severity, respectively [457]. Consistent with research applying the measure to community populations the moderate and severe groups were collapsed [458, 459]. The cut points of <5, 5-9, ≥10 were therefore used and re-labelled low, moderate and high somatic symptom severity, respectively. The variable was derived to be tested as a mediator and confounder in separate sections of the thesis.

#### 2.7.2.2 Somatic symptom severity (S1+S2)

The PHQ-15 was also used to measure somatic symptom severity in S2. The same scoring process used in S1 was applied (outlined above in 2.7.2.1). Fifty-one respondents indicated that the sexual intercourse item was inapplicable, and 1 respondent responded “do not know” to this item. The data for the PHQ-15 in S2 were otherwise complete with the exception of 1 missing from 1 item due to responding “do not know”. All these missing were recoded as 0 in order to produce a count variable. This was categorised according to the same boundaries applied in S1 (<5, 5-9, ≥10), thus generating a comparable three category variable of low, moderate and high somatic symptom severity in S2.

The S1 and S2 measures were cross-tabulated to produce a derived variable of somatic symptom severity over time. The derived variable consisted of 3 categories of 1) low (PHQ-15 score of 0-4 at S1 and S2), 2) moderate (5-9 at S1 and/or S2), and 3) high (≥10 at S1 and/or S2) somatic symptom severity. This variable was derived in order to be used as an explanatory factor in prospective analyses.

### 2.7.3 Self-rated health

#### 2.7.3.1 Self-rated health (S1)

The 12-item short form Health Survey (SF-12) is a validated survey measure of health and functioning [460, 461] and was used in both the SELCoH surveys. It asks 12 questions relating to 8 dimensions of health, producing a physical and mental component score, as well as a number of sub-scales which may be used separately from the total component scores [462].

Self-rated health in S1 was indicated using an item from the SF-12, which produces a global indication of a persons' perceived health [460, 463]. The question asks respondents to rate their "general health" on a 5-point scale: excellent, very good, good, fair, poor. Binary variables of this measure were produced, grouping those who reported excellent, very good, and good health, and those who reported fair or poor health. Six respondents refused to answer this question, and 4 were true missing.

#### 2.7.3.1 Self-rated health (S1+S2)

An equivalent binary variable of self-rated health variable was derived in the S2 sample. The item had no missing data.

Self-rated health in S1 and S2 were cross-tabulated to produce a binary variable to capture global health perceptions over time. The derived variable distinguished between those who reported excellent, very good, or good health at S1 and S2, and those who reported fair or poor health either at S1 or S2. The variable had missing data for 3 respondents who refused to respond to the self-rated health item in S1, and 3 true missing from the S1 measure.

### 2.7.4 Perceived functioning limitations due to emotional health

#### 2.7.4.1 Perceived functioning limitations due to emotional health (S1)

Using 1 of the 2 items contributing to the "role emotional" sub-scale of the SF-12 [464], a binary variable of perceived functional limitations due to emotional health was created. This item was used as a subjective indicator of functioning. The item that asked: "During the past 4 weeks, have you accomplished less

than you would like with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?". Six refused to answer this item, and an additional 10 were true missing. The variable was intended to be used as a mediator and explanatory factor in separate analyses of the thesis.

### 2.7.1 Daily functioning problems

#### 2.7.1.1 Daily functioning problems (S1)

A more objective measure of daily functioning problems was provided by a measure of activities of daily living from the Health Assessment Questionnaire [465]. The measure asks respondents to indicate whether they experience limitations in any out of five domains of daily living. The item asked, "Do you have any difficulties with any of the following activities?" prompting respondents to endorse all that applied. The domains include personal care (e.g. dressing, washing), getting out and about or using transport, medical care (e.g. taking medicine or pills), household activities (e.g. preparing meals, shopping), and managing money (e.g. budgeting for food). The domains were added up to produce a total score of functional limitations ranging from 0-5. The total scores were positively skewed; therefore the variable was made binary, using the cut point of 2 or more limitations.

There were 20 missing values from the daily functioning problems measure: 13 refused to respond, data for 6 respondents were true missing and data for 1 respondent were missing due to equipment error.

#### 2.7.1.2 Daily functioning problems (S1+S2)

The measure of activities of daily living was also used in S2. An equivalent daily functioning problems variable was created by using the same coding process as for S1, outlined above (2.7.1.1). The item was not included in the CATI interview schedule; thus data were missing for the 29 respondents who completed the S2 survey using CATI.

The S1 and S2 measures of daily functioning problems were cross-tabulated, generating a binary variable which captured practical limitations over time. The derived variable grouped those who reported 2 or more daily functioning

problems either at S1 and/or at S2, and contrasted these against those who reported fewer than 2 problems in S1 and S2. In addition to the missing data for the 29 CATI respondents, there were missing data for 8 respondents who had missing data from the S1 measure of activities of daily living (5 refused to respond and 3 true missing).

### 2.7.2 Trajectories of perceived social functioning (S1+S2)

A composite measure of perceived social functioning trajectories was derived for use as an outcome measure. It was composed using both S1 and S2 measures from the SF-12 item measuring social functioning. The item asked "During the past four weeks how much of the time has your physical health or emotional problems interfered with your social activities". Respondents were prompted to select 1 of 6 response options: "none of the time", "a little of the time", "some of the time", "a good bit of the time", "most of the time", or "all of the time". A binary distinction between these categories were made such that interference with social activities "none of the time" or "a little of the time" was considered "good" functioning, and interference "some", "a good bit", "most" or "all of the time" was considered "poor" functioning. According to this distinction, a four-categorical variable of trajectories of perceived social functioning was derived by cross-tabulating social functioning reported at S1 and S2 (Table 11). The categories were: 1) good : good, 2) poor : good, 3) good : poor, and 4) poor : poor.

The derived perceived social functioning trajectory variable contained missing data for 9 respondents, due to missing data from the S1 functioning measure (4 refused to respond, 5 were true missing). The data were intact from all S2 respondents for the S2 functioning measure.

Table 11 Derived variable of perceived social functioning trajectories (S1+S2)

| **Perceived social functioning (S1)** | **Perceived social functioning (S2)** | | | | | | **Total** |
|---|---|---|---|---|---|---|---|
| | None of the time | A little of the time | Some of the time | A good bit of the time | Most of the time | All of the time | |
| None of the time | 491 | 110 | 53 | 17 | 10 | 8 | 689 |
| A little of the time | 60 | 49 | 16 | 6 | 7 | 4 | 142 |
| Some of the time | 23 | 11 | 10 | 7 | 9 | 3 | 63 |
| A good bit of the time | 29 | 16 | 19 | 11 | 2 | 2 | 79 |
| Most of the time | 14 | 3 | 10 | 10 | 16 | 4 | 57 |
| All of the time | 1 | 0 | 2 | 4 | 4 | 2 | 13 |
| **Total** | 618 | 189 | 110 | 55 | 48 | 23 | 1043 |

- Good : good (n=710)
- Poor : good (n=97)
- Good : poor (n=121)
- Poor : poor (n=115)

### 2.7.3 Attitudes towards help-seeking (S2)

In the SELCoH 2 survey 3 questions relating to attitudes towards help-seeking for mental health problems were asked. These were items from the National Comorbidity Survey-Replication (NCS-R) [359] and included:

1. If you had a serious emotional problem, would you go for professional help?
2. Would you feel comfortable talking about personal problems with a professional?
3. Would you be embarrassed if your friends knew that you were getting professional help for an emotional problem?

Each of these items was rated by respondents on a 4-point Likert scale ranging from “definitely”, “probably”, “probably not” to “definitely not”. Each of the three items were recoded into binary variables by collapsing “definitely” and “probably”, and “probably not” and “definitely not”.

There were 2 missing values from items 1 and 2 (1 refused to respond and 1 reported that they did not know). Data missing from item 3 included 1 respondent who refused to respond, 3 respondents who indicated that they did not know, and 2 respondents who reported that the item was inapplicable to them.

### 2.7.4 Perceived mental health treatment benefits (S2)

The service use section in SELCoH 2 included an item asking about perceptions of benefit from mental health treatments. The question asked: “*In your view, what percentage of persons (out of 100%) do you believe benefit from professional treatment for emotional problems?*” and was also taken from the NCS-R study [359]. The continuous measure ranging from 0-100 was negatively skewed, and was thus made into a categorical variable with 3 groups of low, moderate and high benefit perceptions representing <50, 50-74, and ≥75 respectively. There were no missing values from this measure.

## 2.8 Social measures

### 2.8.1 Psychosocial resources

Measures of psychosocial resources included social network size and hypothetical/actual instrumental and emotional support. The measures were a shortened versions of a measure developed by sociologists to assess community ties, social networks and intimate ties [466]. These measures were included in the S1 survey only, and used as explanatory variables in the analyses.

#### 2.8.1.1 Social support (S1)

The social support measures comprised 4 questions where the respondent was asked to indicate whether they would be able to get help or assistance in hypothetical scenarios presented to them. Two questions asked about instrumental support (“someone to lend you money to pay bills or help you get along”; “someone to help you deal with an emergency (minor or health emergency)”), and another 2 asked about emotional support (“someone to talk to about something that was bothering you or when you felt lonely and wanted some company”; “someone to make you feel good, loved or cared for”). A binary measure of social support was derived by grouping those who endorsed having social support for all 4 items (“high social support”), and contrasting these against all other respondents (“low social support”). From the derived variable there were 16 true missing and 11 missing due to refusals to respond.

#### 2.8.1.2 Social network size (S1)

The social network size item asked: “In a typical week, how many of the following people do you come in contact with? By contact, we mean talking either face to face or by phone.” Respondents were asked to select all that applied from the following response options: brother/sister, in-laws, other relatives, close friends, neighbours, co-workers, boss/supervisor, other acquaintances, helping professionals, member of same group or club. These were added up to produce a cumulative measure of contacts. The variable was normally distributed ranging from 0-10. This was split into three categories of 0-2 contacts, 3-4 contacts, and 5 or more contacts. Categories were informed by preliminary analyses indicating that this categorisation best captured how the

variable distributed across comorbidity groups. Three refused to respond to this question and 11 were missing.

### 2.8.2 Stressful life events

Stressful events in childhood and during the entire lifetime were measured in both the SELCoH surveys, but the questions changed in order to make the S2 survey comparable to the parallel US community study (see section 2.1). The process of deriving these measures in S1 and S2 are listed in the respective sections below.

#### 2.8.2.1 Stressful life events (S1)

In S1, stressful events were measured by self-reported experiences of 9 listed stressful events in childhood and 11 separate events in lifetime, outlined in Table 12. The events were selected using a combination of different checklist measurements from the literature on stressful experiences relevant to inner city populations [467, 468].

These items contributed to a cumulative variable of stressful life events in lifetime, which was split into 3 categories: 0-2, 3-5, and 6 or more stressful life events. The category boundaries were based on preliminary analyses indicating that this categorisation most appropriately captured the distribution of events across the comorbidity categories. Given that reporting of certain lifetime events may have referred to similar childhood events that were measured, this potential overlap was accounted for by excluding them from the cumulative variable if similar events had been reported in childhood (Table 12).

Data from at least 1 item was missing for 68 of the S1 respondents. The respondents with 10 or more missing values from the 20 items (n=15) were recoded as missing (n=10 refused to respond, n=5 were true missing). The remaining 53 respondents only had data missing for a maximum of 3 of the total 20 items. A cumulative score based on the data available was estimated for these respondents. Thus, data were missing for a total of 15 respondents for the stressful life events measure.

#### 2.8.2.2 Stressful life events (S1+S2)

In SELCoH 2, the questions about stressful events were revised such that all questions could apply to experiences in childhood, adulthood or the past 12 months. The stressful life events items numbered 10-19 in Table 12 were S1 items that were also included in S2. An additional five items (numbered 21-25) were introduced in the S2 survey. Endorsed responses (i.e. reported experiences in childhood, adulthood and/or past-12 months) were added and produced a cumulative variable.

Questions about stressful events were not included in the CATI interview schedule; thus data were missing for the 29 respondents who were interviewed using over the phone.

A cumulative variable of stressful life events over the life course was created by adding all reported events in S1 and S2. To avoid potential double-counting of the same events, items 10-19 were only counted once if they were reported in both S1 and S2. The variable was made categorical according to the boundaries used for the S1 measures (0-2, 3-5, and 6 or more). The derived variable had missing data for a total of 35 respondents: 29 who completed CATI in S2, 4 who refused to respond in S1 and 2 true missing from the S1 variable.

Table 12 Stressful life events items in SELCoH 1

| | | Included in S1 | Included in S2 |
|---|---|---|---|
| **Stressful life events in childhood (before age 16):** | | | |
| 1 | Did you ever have a major illness or accident that required you to spend a week or more in hospital? | ✓ | |
| 2 | Did your parents get a divorce? | ✓ | |
| 3 | Did either of your parents die? | ✓ | |
| 4 | Were you ever separated from either of your parents or not living in the household with both parents? | ✓ | |
| 5 | Did anyone ever hit you so hard that it left bruises or marks? | ✓ | |
| 6 | Did anyone who was responsible for your care such as a parent, caregiver, or babysitter—or someone else who was at least 5 years older than you—ever sexually abused you? | ✓ | |
| 7 | Up to the age of 16 did you spend any time in any kind of institution such as a children's home, borstal, or young offenders unit (excluding private education or boarding school)? | ✓ | |
| 8 | Were you ever taken into Local Authority Care (that is into a children's home or foster care) as a child up to the age of 16? [a] | ✓ | |
| 9 | Did you drop out of school before the age of 15 before you received your qualification? | ✓ | |
| **Stressful life events during lifetime** | | | |
| 10 | Have you ever lived with someone as a couple and that relationship ended in separation or divorce? | ✓ | ✓ |
| 11 | Has a spouse/partner, child, or other loved one died? [b] | ✓ | ✓ |
| 12 | Have you ever seen something violent happen to someone (e.g., attacked or beaten) or seen someone killed? | ✓ | ✓ |
| 13 | Have you ever had a serious accident? [c] | ✓ | ✓ |
| 14 | Have you ever been in combat in a war, lived near a war zone, or been present during a political uprising? | ✓ | ✓ |
| 15 | Have you ever experienced a period where you slept in a park or in a temporary residence because you had no money to pay for rent? | ✓ | ✓ |
| 16 | Have you ever been attacked, mugged, robbed, or been the victim of a serious crime? | ✓ | ✓ |
| 17 | Has anyone ever injured you with a weapon – gun, knife, stick, etc.? | ✓ | ✓ |
| 18 | Has anyone ever hit you, bit you, slapped you, kicked you, or forced you to have sex against your wishes? [d] | ✓ | ✓ |
| 19 | Has one of you children ever had a serious illness or accident? | ✓ | ✓ |
| 20 | Has any of your children have any special needs? | ✓ | |
| 21 | Has your adult child moved back into your home? | | ✓ |

| | | |
|---|---|---|
| 22 | Has your responsibility for the care of grandchildren increased substantially? | ✓ |
| 23 | Has your aging parent or in-law moved into your home? | ✓ |
| 24 | Have you had to place your aging spouse, in-law or parent into a nursing home? | ✓ |
| 25 | Have you ever experienced any legal difficulties that have affected your right to stay in the UK? | ✓ |

[a] did not contribute to cumulative S1 variable if question 7 was endorsed
[b] did not contribute to cumulative S1 variable if question 3 was endorsed
[c] did not contribute to cumulative S1 variable if question 1 was endorsed
[d] did not contribute to cumulative S1 variable if either question 5 or 6 were endorsed
If endorsed in both S1 and S2, items 10-19 were only counted once for the cumulative S1+S2 variable

## 2.9 An overview of the analytic strategy

All analyses are carried out in Stata 11 [469]. Given that the measures used in this thesis are quantitative and predominantly categorical, statistical methods include cross-tabulation with chi-square tests and Rao & Scott corrections, logistic regression, and multinomial regression methods.

Cross-tabulations showing the joint frequency distribution examine bivariate relationships between independent variables and outcomes. Percentage prevalence estimates are estimated with 95% confidence intervals, and the Chi-square statistic with Rao & Scott corrections test the bivariate associations by comparing the observed distribution of cell counts against the expected distribution.

Regression methods test the direction and strength of specific associations, calculating effect sizes with 95% confidence intervals as precision estimates of the associations. The exponentiated coefficients from multinomial logit models are odds ratios estimated in relation to the reference category, commonly referred to as relative risk ratios (RRRs). The term RRR has been criticised for being easily conflated with risk ratios, which are distinctly different [470], and thus some researchers use the term multinomial odds ratios instead [e.g. 471, 472, 473]. However, in keeping with the majority of the epidemiological literature, the term RRR will be consistently used in order to refer to the exponentiated coefficient from multinomial logit models.

The SELCoH used a clustered survey design which recruited multiple residents within households. This made the respondents more similar, violating the independence assumption of the statistical tests. Analyses account for this design effect by applying weights using Stata *svy* commands, calculating robust standard errors for prevalence estimates and associations. Inverse probability weights also adjust for non-response within households. The weights are informed by predicted response probabilities from regression models testing the inclusion of eligible non-responding household members [51, 474]. In addition to clustering and non-response, the weights applied to the S2 sample also account for attrition and any changes in household composition between S1 and S2 measurement timepoints. In all Tables presented in the thesis frequencies are

unweighted, while mean estimates, percentage estimates, odds ratios and RRRs are calculated using the appropriate weights, unless otherwise specified.

An overview of analyses applied in each chapter addressing the specific aims is provided below.

### 2.9.1 Chapter 3: The prevalence and distribution of mental-physical comorbidity

Chapter 3 will address aim 1 of the thesis:

1. To estimate the prevalence of comorbidity, and describe inequalities in mental-physical comorbidity by key socio-demographic and socio-economic factors

In order to address this broader aim the following three specific aims will be addressed:

A1.1 To establish the prevalence of mental-physical comorbidity in an urban community setting.

A1.2 To describe the unadjusted distribution mental-physical comorbidity by key socio-demographic and socio-economic factors.

A1.3 To estimate independent associations of socio-demographic and socio-economic factors with comorbidity, whilst controlling for explanatory factors.

The following hypotheses will be tested:

Relative to no (mental or physical) illness:

H1) women are at greater risk of non-comorbid CMDS.

H2) women are at greater risk of CMDS-physical comorbidity.

H3) there is an association between age and comorbidity, such that older persons are at greater risk of comorbidity.

H4) there is an association between age and non-comorbid physical illness, such that older persons are at greater risk of non-comorbid physical illness.

H5) those reporting single relationship status or previously being in relationship are at greater risk of comorbidity, compared to those reporting married/cohabitating relationship status.

H6) ethnic minority status is associated with greater risk of comorbidity.

H7) recent migration status is not associated with greater risk of comorbidity compared to non-migrants.

H8) longer-stay migration status is associated with greater risk of comorbidity, compared to more recent migration status and non-migrants.

H9) indicators of low SES including low educational attainment, non-employment, low household income, debt, and benefits receipt, are at greater risk comorbidity.

H10) Relative to either to non-comorbid mental or physical illness the hypothesised vulnerable statuses (ethnic minority status (H6), longer UK residing migrants (H8) and groups of low SES (H9)) are at greater risk of comorbidity.

The analyses will be cross-sectional using the S1 data, describing the unadjusted and adjusted socio-demographic and socio-economic distribution of comorbidity (Figure 16). Health-related and social indicators will be incorporated as explanatory factors.

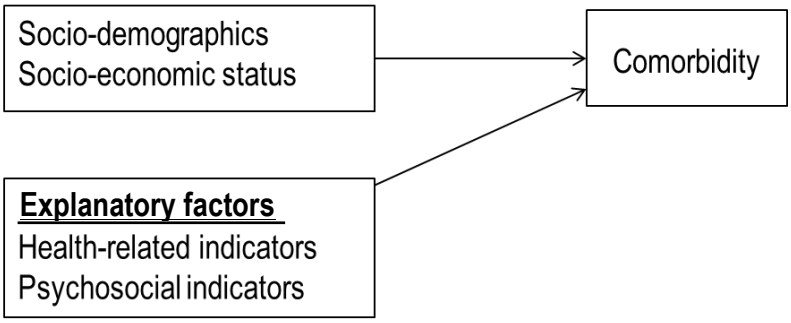



Figure 16 Model tested in Chapter 3: The distribution of mental-physical comorbidity

### 2.9.2 Chapter 4: The association between mental-physical comorbidity and mental health service use

Chapter 4 presents analyses addressing aim 2:

2. To describe and explain the association between comorbidity and mental health service utilisation and quality
   - A2.1 To estimate the prevalence of MHSU.
   - A2.2 To test associations between comorbidity, and MHSU and quality outcomes.
   - A2.3 To test associations between comorbidity, and perceived health and functioning.
   - A2.4 To test associations between perceived health and functioning, and MHSU outcomes.
   - A2.5 To test the mediating effect of perceived health and functioning in the associations between comorbidity and MHSU outcomes.

The hypotheses tested are:

H1) Compared to those reporting no MIS and non-comorbid MIS, those reporting comorbidity at S1 are more likely to report uptake of mental health services, such that:

a. there is a cross-sectional association between comorbidity at S1 and primary and secondary MHSU at S1.

b. there is a prospective association between comorbidity at S1 and primary and secondary MHSU at S2.

c. there is an association between comorbidity at S1 and more continuous MHSU over time. (Aim 2.2)

H2) Compared to those reporting no MIS and non-comorbid MIS, associations between comorbidity and secondary MHSU are stronger relative to associations between comorbidity and primary MHSU (Aim 2.2).

H3) Compared to those reporting no MIS and non-comorbid MIS, associations between comorbidity and continuous MHSU are

stronger relative to associations between comorbidity and either discontinued or initiated MHSU (Aim 2.2).

H4) Compared to those reporting no MIS and non-comorbid MIS, those reporting comorbidity are registered with GP practices performing more poorly on quality indicators of mental health care (Aim 2.2).

H5) Compared to those reporting no MIS and non-comorbid MIS, those reporting comorbidity report poorer perceived health and functioning (Aim 2.3).

H6) Relative to no MHSU, there is greater cross-sectional and prospective primary and secondary MHSU, and greater continuous MHSU over time among those reporting poorer perceived health and functioning (Aim 2.4).

H7) Indicators of poor perceived health and functioning mediate the cross-sectional and prospective associations between comorbidity and MHSU, and the association between comorbidity and continuous MHSU, such that associations are fully attenuated when these variables are incorporated into the model (Aim 2.5).

H8) After adjusting for other potential mediators and explanatory factors, perceived functioning limitations due to emotional health remains associated with greater cross-sectional and prospective primary and secondary MHSU, and greater continuity of MHSU (Aim 2.5).

The analytical models addressing the hypotheses are depicted in Figure 17. The analyses were both cross-sectional making use of the S1 sample, and longitudinal making use of the S2 sample. The unadjusted association between comorbidity and MHSU is first tested with multinomial regression methods in (a). In preparation for mediation tests, unadjusted associations between comorbidity and the potential mediators are then tested (b), followed by tests of associations between the potential mediators and MHSU outcomes (c). Subsequently, mediation models testing model (d) are performed. These individually test each potential mediator in 3-variable models. Fully adjusted models then assessed the independent effects of the mediators after controlling

for explanatory factors (not shown). Five domains of explanatory factors were considered: socio-demographic, socio-economic status, health-related, social and attitudinal.

Four service use outcomes are considered, allowing for a comprehensive understanding of associations between comorbidity and MHSU. These included: cross-sectional associations with quality of mental health services (QOF variables), cross-sectional associations with MHSU (MHSU S1), longitudinal associations with MHSU (MHSU S2), associations between comorbidity and MHSU change (MHSU S1+S2),

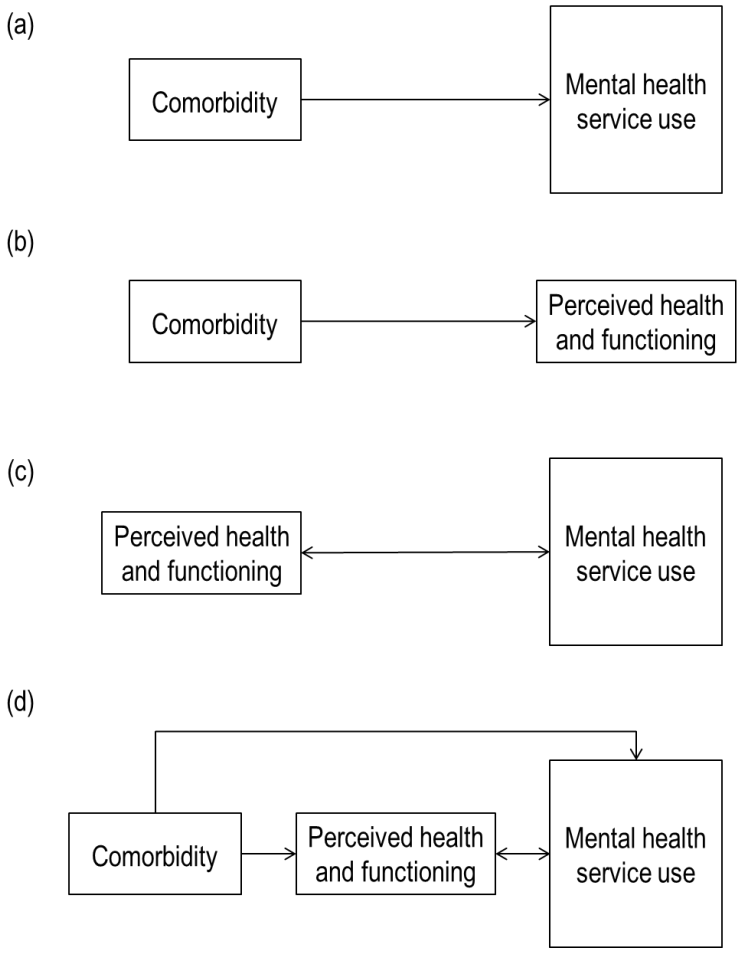



Figure 17 (a) Tests of associations between comorbidity and MHSU outcomes (A2.2); (b) Tests of associations between comorbidity and perceived health and functioning (A2.3); (c) Tests of associations between perceived health and functioning and MHSU outcomes (A2.4); (d) Test of the mediating effect of perceived health and functioning in the associations between comorbidity and MHSU (A2.5)

### 2.9.3 Chapter 5: Comorbidity and trajectories of social functioning

The final results chapter presents analyses addressing aim 3:

3. To describe the trajectories of social functioning by comorbidity.

The hypothesis tested is:

H) Comorbidity will be associated with greater and more persistent social functioning impairment.

The analyses in Chapter 5 are prospective, making use of the S2 sample. Two indicators of social functioning are used. Employment/education trajectories are used as a more objective indicator of social functioning, while trajectories of perceived social functioning represent a more subjective indicator of social functioning. Unadjusted and adjusted multinomial regression models tested associations between comorbidity and trajectories of employment and social functioning (Figure 18 and Figure 19). Explanatory factors considered for inclusion in the adjusted model of employment/education trajectories are socio-demographics, health-related and social indicators. Socio-economic indicators are not included in the interest of avoiding collinearity. In contrast, adjusted models testing associations between comorbidity and perceived social functioning include socio-demographics, health-related, psychosocial correlates as well as socio-economic indicators.

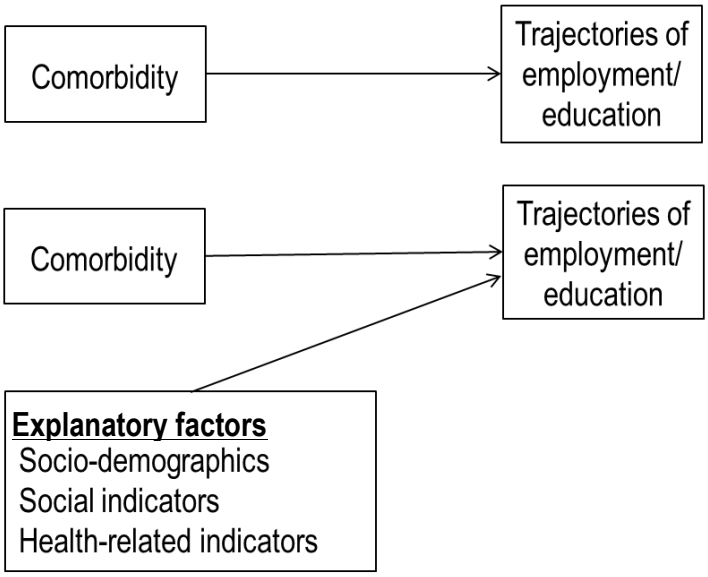



Figure 18 Unadjusted and adjusted models tested in Chapter 5: employment/education trajectories

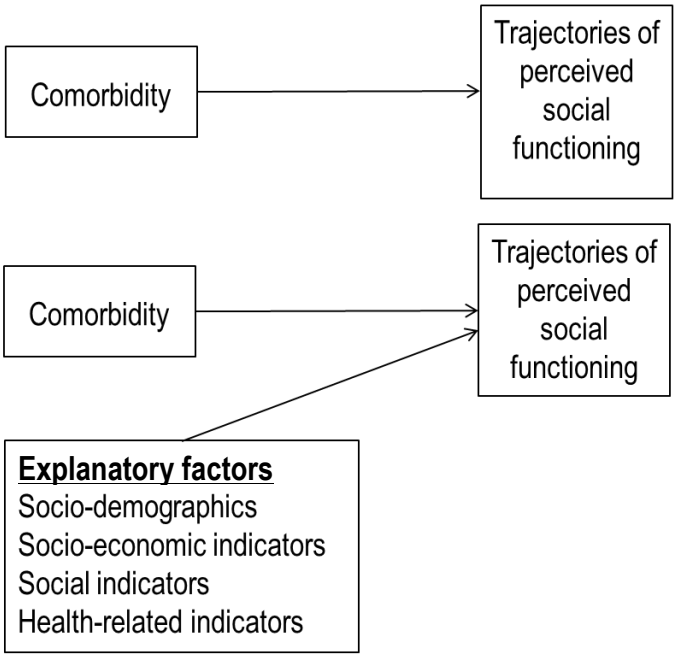



Figure 19 Unadjusted and adjusted models tested: PSF trajectories

# Chapter 3 The prevalence and distribution of mental-physical comorbidity

## 3.1 Chapter summary

This chapter addresses the first aim of the thesis: “to estimate the prevalence of comorbidity and describe inequalities in mental-physical comorbidity by key socio-demographic and socio-economic factors”. The results indicate that mental-physical comorbidity is common, affecting 16% of the adult population in South East London. Comorbidity was more prevalent among older age groups and among women. The socio-demographic disadvantaged statuses including ethnic minority groups and long-term migrants were not associated with comorbidity. Socio-economic disadvantage was on the other hand associated with comorbidity, as indicated by low education, non-employment and low household income. These findings support theoretical arguments that multiple flexible health resources are disproportionately distributed to the disadvantage of low SES groups, and generate inequalities in health. Three explanations of the associations between low SES and comorbidity are proposed: low SES may 1) act as a broad risk factor of both mental and physical illness, 2) interact with pre-existing illness to amplify the risk of comorbidity, or 3) perpetuate comorbidity, such that comorbidity is more likely to reoccur and become chronic among lower SES groups. Self-rated health was the most important explanatory variable of the SES and comorbidity association. To the extent that self-rated health may represent illness burden, this may point towards a particularly important role of the third mechanism.

## 3.2 Introduction

### 3.2.1 Rationale

A fundamental aim of epidemiology is to examine patterns of disease or disorder across populations. Whilst the frequent co-occurrence of mental and physical illness is well-established, prevalence estimates vary greatly depending on methodology, setting and the types of mental illnesses examined. Furthermore, most research into comorbidity has investigated immediate mechanisms between mental-physical illnesses, often focusing on disease specific pathways, despite epidemiological evidence suggesting that mental-physical comorbidity is non-disease or disorder specific [50, 126, 129, 130, 132]. Limited research has sought to map the socio-demographic and socio-economic distribution of mental-physical comorbidity which may provide insights into the broader social determinants of comorbidity.

Adversity and lack of resources may put vulnerable social groups at greater risk of mental and physical illness by influencing morbidity-driven risk factors (e.g. psychosocial stress, health behaviours), and thus also at greater risk of comorbidity. Adverse experiences and limited resources may also precipitate some of the morbidity-driven comorbidity mechanisms, such that the risk of developing a comorbid condition in the context of a non-comorbid illness is higher for vulnerable groups. Health inequalities in comorbidity may thus be greater than inequalities in non-comorbid mental or physical illness, but this research question has not yet been explored.

I will address these limitations by providing estimates of general mental-physical comorbidity in a community setting, as well as further distinguishing the prevalence of comorbidity according to common mental disorder symptoms (CMDS) and psychotic symptoms (PS). I will also comprehensively examine the socio-demographic and socio-economic distribution of these different typologies of comorbidity.

As noted in Chapter 1 (1.3.1.3), the term “comorbidity” is used to refer to the co-occurrence of at least one mental and one physical condition, irrespective of the number of mental or physical conditions in addition to these.

### 3.2.2 Aims and hypotheses

#### 3.2.2.1 Broad and specific aims

This chapter sets out to address the first overarching aim of the thesis, “to estimate the prevalence of comorbidity, and describe inequalities in mental-physical comorbidity by key socio-demographic and socio-economic factors”. Three specific aims for the chapter were set:

A1.1 To establish the prevalence of mental-physical comorbidity in an urban community setting.

A1.2 To describe the unadjusted distribution mental-physical comorbidity by key socio-demographic and socio-economic factors.

A1.3 To estimate independent associations of socio-demographic and socio-economic factors with comorbidity, whilst controlling for explanatory factors.

#### 3.2.2.2 Hypotheses

Based on the literature, reviewed in Chapter 1 the following hypotheses were formed.

Relative to no (mental or physical) illness:

H1) women are at greater risk of non-comorbid CMDS.

H2) women are at greater risk of CMDS-physical comorbidity.

H3) there is an association between age and comorbidity, such that older persons are at greater risk of comorbidity.

H4) there is an association between age and non-comorbid physical illness, such that older persons are at greater risk of non-comorbid physical illness.

H5) those reporting relationship status as single or previously in relationship are at greater risk of comorbidity, compared to those of married/cohabitating relationship status.

H6) ethnic minority status is associated with greater risk of comorbidity.

H7) recent migration status is not associated with greater risk of comorbidity compared to non-migrants.

H8) longer-stay migration status is associated with greater risk of comorbidity, compared to more recent migration status and non-migrants.

H9) indicators of low SES including low educational attainment, non-employment, low household income, debt, and benefits receipt, are at greater risk comorbidity.

H10) Relative to either to non-comorbid mental or non-comorbid physical illness the hypothesised vulnerable social statuses (ethnic minority status (H6), longer UK residing migrants (H8) and groups of low SES (H9)) are at greater risk of comorbidity,

## 3.3 Methods

### 3.3.1 Data

Data from the first wave of the South East London Community Health study (SELCoH 1, S1) were used. This allowed for an in depth cross-sectional understanding of the prevalence of comorbidity and potential inequalities in comorbidity.

### 3.3.2 Measures

All measures were from the S1 dataset. The measures are briefly outlined below; detailed descriptions of the measures are provided in Chapter 2.

#### 3.3.2.1 Outcome variable: Comorbidity

3 comorbidity variables used: overall mental illness symptoms (MIS)-physical comorbidity, CMDS-physical comorbidity, and PS-physical comorbidity. These were derived by cross-tabulating 3 measures of mental health against a physical health variable to derive variables consisting of 4 groups: 1) no identified illness, 2) non-comorbid mental illness, 3) non-comorbid physical illness and 4) comorbid mental-physical illness. The process of deriving these variables is described in detail in section 2.3.4.6.

#### 3.3.2.2 Independent variables

The independent variables included socio-demographic and socio-economic variables (independent variables of interest) and explanatory factors. The distributions of the independent variables in the S1 sample are shown in Table 13.

##### 3.3.2.2.1 Sociodemographic variables

The sociodemographic information from SELCoH included: gender, age (categorical measure), relationship status, ethnicity and migrant status. The age variable categorised age into 5 groups (16-29, 30-39, 40-49, 50-59, 60 or over). For analyses using the PS-comorbidity variable, the 50-59 and the 60 or over groups were collapsed in order to improve the distribution of the variable due to small cell counts. The relationship status variable distinguished between: married/cohabitating, single and previously in relationship. The 4-group ethnicity variable included the following categories: White British, Black Caribbean, Black

African, and Other. The migrant status variable combined the birthplace and length of residence in the UK to produce a three-category variable of: non-migrants (UK born), migrants residing less than 10 years in the UK, and migrants residing 10 or more years in the UK. The socio-demographic variables are described in detail in section 2.5.

#### 3.3.2.2.2 Socio-economic variables

Socio-economic indicators included educational attainment, employment status, household income, debt, and benefits receipt. Educational attainment was categorised as no qualifications, GCSE (or Ordinary Level) qualifications, Advanced level (A-level) qualifications; and degree or above. Employment status grouped those who were in work (full-time, part-time, casually, working students or temporarily off work due to illness), not working (unemployed, permanently off work due to illness or disability, retired, or looking after children at home), and students (not working). Gross annual household income from all sources before any deductions was measured using the following categories: £0 - 5,475, £5,476 - 12,097, £12,098- 20,753, £20,754- 31,494 and £31,495 or more. The debt variable indicated serious delay on any past-year payments including: rent, mortgage repayments, and utility bills among others. The benefit receipt variable included reporting current receipt of any non-health related benefits (Jobseeker's Support Allowance, Income Support Allowance, Family/Working Families Tax Credit and "other" benefits). For detailed descriptions of the socio-economic variables, see section 2.6.

#### 3.3.2.2.3 Explanatory factors

Age and gender were considered important socio-demographic explanatory factors. For analyses where age was conceptualised as an explanatory factor, the continuous age measure was used. Additional explanatory factors included self-rated health, poor health behaviours, social support, social network size and self-reported stressful life events (see sections 2.7 and 2.8). The 5-point measure of self-rated health from the SF-12 [463] was made binary, grouping fair and poor health compared to good, very good or excellent. A composite variable of poor health behaviours was constructed using the measures of current smoking and the eight point cut-off of the Alcohol Use Disorders Identification Test (AUDIT) to indicate hazardous alcohol use [456]. The variable consisted of three categories: no poor health behaviours (neither

smoking nor hazardous alcohol use), 1 poor health behaviour (but not the other), and 2 poor health behaviours (both smoking and hazardous alcohol use).

Social support distinguished between high and low perceived availability of emotional and instrumental support. Social network size referred to the number of self-reported weekly contacts with different groups of people (e.g. close friends, co-workers etc.) and was grouped into categories of 0-2, 3-4, 5 or more. A cumulative score of stressful life events was divided into three categories of 0-2, 3-5, and 6 or more based on the distribution of events reported.

Table 13 Independent variables used (SELCoH 1 sample)

| | N | Mean/% (95% CI) |
|---|---|---|
| ***Gender*** | | |
| Male | 739 | 33.3 (31.4-35.2) |
| Female | 959 | 66.7 (64.8-68.6) |
| ***Age (continuous)*** | 1698 | 43.6 (42.4-44.7) |
| ***Age*** | | |
| 16-29 | 577 | 28.7 (26.3-31.2) |
| 30-39 | 349 | 18.0 (16.0-20.1) |
| 40-49 | 311 | 16.9 (15.1-18.9) |
| 50-59 | 214 | 14.7 (12.8-16.8) |
| 60 or over | 247 | 21.7 (19.1-24.6) |
| ***Relationship status*** | | |
| Married/cohabitating | 786 | 46.4 (43.6-49.2) |
| Single | 678 | 35.7 (33.1-38.3) |
| Previously in relationship | 234 | 17.9 (15.8-20.2) |
| ***Ethnicity*** | | |
| White | 1051 | 63.5 (60.3-66.5) |
| Black Caribbean | 143 | 8.7 (7.1-10.6) |
| Black African | 234 | 13.2 (11.1-15.6) |
| Other | 268 | 14.7 (12.8-16.9) |
| ***Migration status*** | | |
| UK born | 1010 | 61.0 (58.1-63.8) |
| <10 years in the UK | 315 | 16.8 (14.7-19.1) |
| ≥10 years in the UK | 337 | 22.2 (19.9-24.7) |
| ***Education*** | | |
| No qualifications | 228 | 17.0 (14.8-19.4) |
| GCSE | 332 | 20.1 (18.0-22.3) |
| A-level | 426 | 23.7 (21.5-26.0) |
| Degree or above | 693 | 39.3 (36.5-42.1) |
| ***Employment status*** [a] | | |
| Working | 985 | 54.6 (51.8-57.3) |
| Not working | 497 | 35.0 (32.2-37.8) |
| Students | 207 | 10.4 (8.9-12.2) |
| ***Annual household income*** | | |
| £0-5,475 | 139 | 10.4 (8.7-12.3) |
| £5,476-12,097 | 212 | 16.9 (14.7-19.3) |
| £12,098-20,753 | 203 | 15.1 (13.0-17.4) |
| £20,754-31,494 | 179 | 12.1 (10.3-14.1) |
| £31,495 or more | 703 | 45.6 (42.4-48.8) |
| ***Debt*** | | |
| No | 1382 | 83.0 (80.9-84.9) |
| Yes | 296 | 17.0 (15.1-19.1) |
| ***Benefits receipt*** [b] | | |
| No | 1351 | 79.5 (77.2-81.6) |
| Yes | 339 | 20.5 (18.4-22.8) |
| ***Self-rated health*** | | |
| Good/Very good/excellent | 1392 | 80.8 (78.6-82.9) |
| Fair/poor | 296 | 19.2 (17.1-21.4) |
| ***Poor health behaviours*** | | |

| | | |
|---|---|---|
| Neither smoking nor hazardous alcohol use | 1,066 | 66.6 (64.0-69.1) |
| Either smoking or hazardous alcohol use | 466 | 25.7 (23.5-28.1) |
| Smoking and hazardous alcohol use | 149 | 7.7 (6.5-9.2) |
| ***Social support*** | | |
| Low | 351 | 21.8 (19.6-24.2) |
| High | 1320 | 78.2 (75.8-80.4) |
| ***Social network size (no. weekly contacts)*** | | |
| 2 or less contacts | 154 | 10.1 (8.6-11.8) |
| 3-4 contacts | 514 | 31.0 (28.8-33.4) |
| 5 or more contacts | 1,016 | 58.9 (56.3-61.5) |
| ***Stressful life events*** | | |
| 0-2 | 589 | 34.9 (32.4-37.5) |
| 3-5 | 751 | 44.9 (42.4-47.4) |
| 6 or more | 343 | 20.2 (18.2-22.4) |

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.
[b] Benefits are non-health related

### 3.3.3 Analysis

The analyses in this chapter included cross-tabulations estimating prevalence distributions and testing these using Chi-square tests with Rao & Scott corrections, as well as multinomial regression methods. All analyses applied the appropriate S1 weights accounting for clustering and non-response (see section 2.9).

#### 3.3.3.1 Aim 1.1: Prevalence of comorbidity

In order to estimate the proportion of the South East London population affected by comorbidity, the percentage prevalence of comorbidity was estimated with 95% confidence intervals for each of the 3 comorbidity variables (MIS-, CMDS-, and PS-physical comorbidity).

#### 3.3.3.2 Aim 1.2: Distribution of comorbidity

In addressing the second aim, the comorbidity variables were cross-tabulated against socio-demographic and socio-economic indicators. Unweighted frequency distributions and weighted percentage prevalence estimates were estimated, testing proportional differences using Chi-square tests with Rao & Scott corrections. Unadjusted regression models estimated the associations between single independent variables and the comorbidity outcome variables. Given that the comorbidity outcomes consisted of four categories, multinomial regression methods were used, where the “no identified illness” was the

reference. Thus the relative risk ratios (RRRs) estimated the risk of placement in the non-comorbid and comorbid outcome categories, relative to “no identified illness”.

#### 3.3.3.3 Aim 1.3: Independent socio-demographic and socio-economic effects on comorbidity

Multivariate regression methods were used in order to examine the independent effect of each socio-demographic and socio-economic variable on comorbidity while holding explanatory factors constant. These multinomial regression models estimated associations between comorbidity and socio-demographic and socio-economic variables independently from gender and/or age, self-rated health, poor health behaviours, social support, social network size and stressful life events. “No identified illness” represented the reference category. The adjusted models included the explanatory factors, whilst separately considering the socio-demographic and socio-economic variables in order to avoid over-adjustment.

## 3.4 Results of aim 1.1: Prevalence of comorbidity

16% reported overall MIS-physical comorbidity, 14.9% reported CMDS-physical comorbidity, and 5.3% reported PS-physical comorbidity (Table 14). Over half of those reporting MIS, CMDS or PS, reported physical illness (≥54.1%). Physical illness was significantly more common among those reporting any symptoms of mental illness than among those who reported no such symptoms (≤45.9%, $p<0.001$, analyses not shown).

Comorbidity was not driven by greater prevalence of any chronic physical illness in particular among those reporting MIS. Instead, all physical illnesses were reported more by those reporting MIS; the most common physical illness being musculoskeletal problems (27.8%), heart and circulatory problems (20.0%), and respiratory conditions (19.8%) (analyses not shown). The prevalence of specific physical conditions did not vary substantially between CMDS and PS (analyses not shown).

Higher numbers of physical conditions were reported by those reporting symptoms of mental illness compared to those who did not report such symptoms. Of the MIS-physical comorbidity group, 34.0% reported 3 or more physical illnesses, while 14.2% of the non-comorbid physical illness group reported 3 or more physical illnesses. The clustering of physical conditions was more pronounced among those reporting CMDS compared to reporting PS; the percentage of those reporting 3 or more physical illnesses among those reporting CMDS was 35.9%, while 29.6% of those reporting PS indicated 3 or more physical illness.

MIS were more prevalent among those who reported physical illness, compared to those who did not (37.4% among those reporting physical illness, 24.0% among those reporting no physical illness). This was true for both CMDS (34.6% among those reporting physical illness, 20.3% among those reporting no physical illness) and PS (12.4% among those reporting physical illness, 7.6% among those reporting no physical illness; analyses not shown).

Table 14 Prevalence of mental and physical comorbidity

| | | n | % | (95% CI) |
|---|---|---|---|---|
| ***MIS-physical comorbidity*** | | | | |
| No identified illness | | 797 | 43.3 | (40.8-45.8) |
| Non-comorbid MIS | | 247 | 13.6 | (12.0-15.5) |
| Non-comorbid physical illness | | 395 | 27.0 | (24.6-29.5) |
| MIS-physical comorbidity | | 242 | 16.1 | (14.2-18.2) |
| | *Total* | 1681 | 100.0 | |
| ***CMDS-physical comorbidity*** | | | | |
| No identified illness | | 839 | 45.3 | (42.8-47.9) |
| Non-comorbid CMDS | | 204 | 11.6 | (10.1-13.3) |
| Non-comorbid physical illness | | 414 | 28.2 | (25.8-30.7) |
| CMDS-physical comorbidity | | 223 | 14.9 | (13.1-16.9) |
| | *Total* | 1680 | 100.0 | |
| ***PS-physical comorbidity*** | | | | |
| No identified illness | | 961 | 52.6 | (50.0-55.3) |
| Non-comorbid PS | | 86 | 4.3 | (3.5-5.4) |
| Non-comorbid physical illness | | 555 | 37.7 | (35.1-40.3) |
| PS-physical comorbidity | | 82 | 5.3 | (4.3-6.7) |
| | *Total* | 1684 | 100.0 | |

MIS, Mental illness symptoms; CMDS, common mental disorder symptoms; PS, psychotic symptoms
MIS represents a combination of both CMDS and PS. CMDS represents a combination of CIS-R scores ≥12 and any self-declared long-standing common mental disorders. All but 3 cases of longstanding mental illness were included (single cases of special needs, bipolar disorder, and paranoid schizophrenia were excluded).

## 3.5 Results of aim 1.2: Distribution of comorbidity

### 3.5.1 Mental illness symptoms-physical comorbidity

#### 3.5.1.1 Cross-tabulation

Table 15 shows the socio-demographic and socio-economic distribution of MIS-physical comorbidity categories. MIS-physical comorbidity was more common in women, older age groups (peaking at 50-59), among those previously in relationship, the Black Caribbean ethnic group, and migrants residing in the UK 10 years or more. Respondents of Black African ethnicity and more recent migrants reported less MIS-physical comorbidity. Greater levels of comorbidity were found among those reporting lower education, non-working employment status, lower household income, debt, and benefits receipt. The distribution of comorbidity was statistically significant by all socio-demographic and socio-economic indicators.

#### 3.5.1.2 Unadjusted associations

The unadjusted socio-demographic and socio-economic associations from the multinomial regression analyses for comorbid MIS-physical comorbidity are shown in Table 16, where “no identified illness” was used as the reference category. Relative to the reference category, women, those who were single or previously in relationship, and longer UK residing migrants were at elevated risk of placement in the comorbidity category. In contrast, recent migrants were at lower relative risk of comorbidity than non-migrants. The relative risk of MIS-physical comorbidity incrementally increased with age, such that adults in their 30’s were at no elevated risk of comorbidity relative to the 16-29 year age group, while sharp increases in risk were found for the 40-49, 50-59 and 60 or over age groups (test for trend $p<0.001$).

Socio-economic indicators associated with increased relative risk of comorbidity included lower educational qualifications, non-working employment status, lower household income, debt and benefits receipt. The socio-demographic and socio-economic characteristics associated with greater comorbidity risk were also associated with greater relative risk of non-comorbid mental and/or non-comorbid physical illness, but the associations were generally stronger for the comorbidity category. The exceptions were age, such that the older age groups

were at substantially greater relative risk of placement in the non-comorbid physical illness group, and debt for with the associations for non-comorbid MIS and MIS-physical comorbidity were of similar strength. In contrast, those of Black African ethnicity, longer UK residing migrants and students were at lower relative risk of placement in the MIS-physical comorbidity group and the non-comorbid physical illness group.

Table 15 Socio-demographic and socio-economic distribution of mental illness symptoms and physical comorbidity (N=1681)

| | | n % (95% confidence intervals) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | **No identified illness** | | **Non-comorbid MIS** | | **Non-comorbid physical illness** | | **MIS-physical comorbidity** | | *p* |
| ***Gender*** | | | | | | | | | | 0.003 |
| Male | 732 | 371 | 47.0 (43.4-50.6) | 100 | 12.4 (10.2-14.9) | 180 | 28.6 (25.1-32.3) | 81 | 12.1 (9.8-14.8) | |
| Female | 949 | 426 | 41.4 (38.2-44.7) | 147 | 14.3 (12.2-16.7) | 215 | 26.2 (23.2-29.3) | 161 | 18.1 (15.6-20.9) | |
| ***Age*** | | | | | | | | | | <0.001 |
| 16-29 | 575 | 334 | 57.2 (52.8-61.4) | 129 | 22.8 (19.5-26.6) | 62 | 10.9 (8.6-13.7) | 50 | 9.1 (6.9-11.9) | |
| 30-39 | 347 | 211 | 60.5 (55.1-65.6) | 46 | 13.0 (9.7-17.1) | 56 | 16.3 (12.7-20.6) | 34 | 10.3 (7.2-14.4) | |
| 40-49 | 304 | 138 | 43.9 (38.1-50.0) | 42 | 13.9 (10.4-18.5) | 70 | 23.1 (18.6-28.3) | 54 | 19.1 (14.8-24.2) | |
| 50-59 | 211 | 67 | 30.5 (24.3-37.4) | 20 | 9.6 (6.2-14.5) | 70 | 33.5 (27.0-40.6) | 54 | 26.5 (20.6-33.3) | |
| 60 or over | 244 | 47 | 18.6 (14.2-24.0) | 10 | 4.5 (2.4-8.2) | 137 | 56.0 (49.6-62.2) | 50 | 20.9 (15.9-27.0) | |
| ***Relationship status*** | | | | | | | | | | <0.001 |
| Married/cohabitating | 779 | 383 | 45.2 (41.4-49.0) | 80 | 9.6 (7.7-11.9) | 219 | 31.6 (28.1-35.4) | 97 | 13.7 (11.1-16.7) | |
| Single | 671 | 345 | 49.1 (45.1-53.1) | 138 | 19.9 (17.0-23.2) | 103 | 17.1 (14.1-20.5) | 85 | 13.9 (11.3-17.0) | |
| Previously in relationship | 231 | 69 | 26.7 (21.3-32.9) | 29 | 11.7 (8.1-16.6) | 73 | 34.7 (28.5-41.5) | 60 | 26.9 (21.3-33.3) | |
| ***Ethnicity*** | | | | | | | | | | 0.022 |
| White | 1,042 | 477 | 41.6 (38.5-44.8) | 149 | 13.1 (11.1-15.5) | 261 | 28.8 (25.8-32.0) | 155 | 16.5 (14.1-19.2) | |
| Black Caribbean | 141 | 61 | 40.2 (32.1-48.9) | 27 | 16.9 (11.5-24.2) | 26 | 19.8 (13.7-27.8) | 27 | 23.1 (16.3-31.7) | |
| Black African | 230 | 125 | 51.7 (44.6-58.7) | 36 | 14.7 (10.3-20.7) | 49 | 24.5 (18.6-31.5) | 20 | 9.1 (5.7-14.1) | |
| Other | 266 | 134 | 45.3 (38.9-51.9) | 34 | 12.6 (9.0-17.3) | 59 | 25.9 (20.5 32.1) | 39 | 16.2 (12.0-21.7) | |
| ***Migrant*** | | | | | | | | | | <0.001 |
| UK born | 1005 | 464 | 42.3 (39.1-45.6) | 153 | 14.0 (11.9-16.4) | 242 | 28.1 (25.0-31.3) | 146 | 15.6 (13.3-18.3) | |
| <10 years in the UK | 311 | 193 | 59.2 (53.0-65.1) | 50 | 16.9 (12.9-21.7) | 42 | 14.2 (10.5-19.0) | 26 | 9.7 (6.5-14.3) | |
| ≥10 years in the UK | 329 | 118 | 32.2 (27.2-37.7) | 40 | 10.6 (7.7-14.4) | 104 | 34.3 (28.8-40.2) | 67 | 22.9 (18.4-28.3) | |
| ***Education*** | | | | | | | | | | <0.001 |
| No qualifications | 224 | 59 | 23.2 (18.2-29.2) | 26 | 9.8 (6.6-14.3) | 84 | 41.0 (34.3-48.1) | 55 | 26.0 (20.3-32.7) | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GCSE | 326 | 130 | 35.0 | (29.7-40.6) | 59 | 16.1 | (12.4-20.6) | 76 | 28.3 | (23.1-34.1) | 61 | 20.7 | (16.4-25.7) | |
| A-level | 424 | 209 | 47.2 | (42.3-52.1) | 80 | 18.6 | (15.0-22.7) | 79 | 20.0 | (16.2-24.4) | 56 | 14.3 | (11.0-18.2) | |
| Degree or above | 688 | 394 | 54.5 | (50.6-58.3) | 81 | 11.5 | (9.2-14.2) | 150 | 24.2 | (20.9-27.7) | 63 | 9.9 | (7.7-12.6) | |
| ***Employment status[a]*** | | | | | | | | | | | | | | <0.001 |
| Working | 975 | 530 | 51.8 | (48.5-55.2) | 134 | 13.4 | (11.3-15.9) | 206 | 23.0 | (20.3-26.0) | 105 | 11.7 | (9.6-14.1) | |
| Not working | 490 | 136 | 24.7 | (21.0-28.7) | 64 | 11.1 | (8.6-14.1) | 169 | 38.7 | (34.1-43.6) | 121 | 25.5 | (21.6-29.9) | |
| Students | 207 | 127 | 61.0 | (53.6-67.9) | 47 | 22.7 | (17.5-29.0) | 20 | 9.7 | (6.1-15.1) | 13 | 6.6 | (3.8-11.1) | |
| ***Annual household income*** | | | | | | | | | | | | | | <0.001 |
| £0-5,475 | 137 | 42 | 28.3 | (21.4-36.3) | 26 | 16.1 | (11.0-23.0) | 28 | 24.6 | (17.5-33.4) | 41 | 31.1 | (23.4-39.9) | |
| £5,476-12,097 | 209 | 69 | 28.3 | (22.5-34.9) | 31 | 12.9 | (9.1-18.1) | 66 | 36.7 | (29.7-44.2) | 43 | 22.1 | (16.6-28.7) | |
| £12,098-20,753 | 203 | 87 | 38.9 | (32.2-46.0) | 26 | 11.8 | (8.0-17.1) | 48 | 26.1 | (20.2-33.1) | 42 | 23.2 | (17.7-29.9) | |
| £20,754-31,494 | 177 | 90 | 46.4 | (38.4-54.5) | 29 | 15.2 | (10.5-21.5) | 39 | 26.2 | (19.5-34.3) | 19 | 12.2 | (7.7-18.7) | |
| £31,495 or more | 698 | 396 | 54.8 | (50.9-58.5) | 90 | 12.7 | (10.3-15.4) | 152 | 23.8 | (20.6-27.4) | 60 | 8.8 | (6.8-11.3) | |
| ***Debt*** | | | | | | | | | | | | | | <0.001 |
| No | 1,370 | 690 | 45.7 | (42.8-48.5) | 173 | 11.9 | (10.2-13.8) | 339 | 28.5 | (25.9-31.3) | 168 | 13.9 | (12.0-16.1) | |
| Yes | 291 | 103 | 33.9 | (28.3-39.9) | 71 | 22.5 | (18.1-27.7) | 50 | 18.6 | (14.3-24.0) | 67 | 24.9 | (19.9-30.7) | |
| ***Benefits[b]*** | | | | | | | | | | | | | | <0.001 |
| No | 1341 | 667 | 45.4 | (42.6-48.3) | 181 | 12.6 | (10.9-14.6) | 334 | 28.7 | (26.1-31.5) | 159 | 13.2 | (11.3-15.4) | |
| Yes | 332 | 125 | 34.4 | (29.4-39.9) | 66 | 18.0 | (14.4-22.3) | 58 | 19.7 | (15.3-25.1) | 83 | 27.8 | (23.0-33.2) | |

Cell counts may not add up due to missing values.

*p*-values indicate significance from $\chi^2$ tests with Rao & Scott corrections.

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

Table 16 Unadjusted multinomial regression analysis estimating associations between MIS-physical comorbidity categories and socio-demographic and socio-economic indicators

| | Unadjusted relative risk ratio (95% confidence intervals) *p* | | | | | |
|---|---|---|---|---|---|---|
| | **Non-comorbid MIS** | | **Non-comorbid physical illness** | | **MIS-physical comorbidity** | |
| ***Female*** | 1.31 (0.99-1.74) | 0.060 | 1.04 (0.82-1.32) | 0.756 | 1.71 (1.27-2.30) | <0.001 |
| ***Age*** | | | | | | |
| 16-29 | 1.00 | | 1.00 | | 1.00 | |
| 30-39 | 0.54 (0.36-0.79) | 0.002 | 1.41 (0.95-2.10) | 0.088 | 1.07 (0.65-1.75) | 0.798 |
| 40-49 | 0.79 (0.53-1.20) | 0.271 | 2.76 (1.84-4.13) | <0.001 | 2.72 (1.73-4.29) | <0.001 |
| 50-59 | 0.79 (0.45-1.38) | 0.402 | 5.77 (3.69-9.03) | <0.001 | 5.45 (3.36-8.82) | <0.001 |
| 60 or over | 0.60 (0.29-1.25) | 0.172 | 15.79 (10.28-24.24) | <0.001 | 7.04 (4.18-11.84) | <0.001 |
| ***Relationship status*** | | | | | | |
| Married/cohabitating | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.92 (1.40-2.63) | <0.001 | 0.50 (0.37-0.67) | <0.001 | 0.93 (0.65-1.33) | 0.704 |
| Previously in relationship | 2.07 (1.24-3.45) | 0.006 | 1.86 (1.26-2.74) | 0.002 | 3.33 (2.14-5.18) | <0.001 |
| ***Ethnicity*** | | | | | | |
| White | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.33 (0.78-2.28) | 0.293 | 0.71 (0.44-1.16) | 0.176 | 1.45 (0.87-2.43) | 0.158 |
| Black African | 0.90 (0.56-1.44) | 0.667 | 0.68 (0.46-1.02) | 0.060 | 0.44 (0.26-0.77) | 0.004 |
| Other | 0.88 (0.56-1.37) | 0.571 | 0.82 (0.57-1.19) | 0.303 | 0.90 (0.59-1.38) | 0.640 |
| ***Migrant*** | | | | | | |
| UK born | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 0.86 (0.59-1.26) | 0.445 | 0.36 (0.24-0.54) | <0.001 | 0.44 (0.27-0.73) | 0.001 |
| ≥10 years in the UK | 1.00 (0.66-1.50) | 0.983 | 1.60 (1.16-2.23) | 0.005 | 1.93 (1.33-2.79) | <0.001 |
| ***Education*** | | | | | | |
| No qualifications | 2.01 (1.16-3.47) | 0.013 | 3.98 (2.69-5.91) | <0.001 | 6.15 (3.82-9.90) | <0.001 |
| GCSE | 2.19 (1.44-3.32) | <0.001 | 1.83 (1.28-2.61) | 0.001 | 3.25 (2.12-4.97) | <0.001 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A-level | 1.87 | (1.31-2.69) | <0.001 | 0.96 | (0.69-1.32) | 0.792 | 1.66 | (1.09-2.53) | 0.018 |
| Degree or above | 1.00 | | | 1.00 | | | 1.00 | | |
| ***Employment status[a]*** | | | | | | | | | |
| Working | 1.00 | | | 1.00 | | | 1.00 | | |
| Not working | 1.73 | (1.20-2.50) | 0.003 | 3.53 | (2.65-4.72) | <0.001 | 4.60 | (3.27-6.47) | <0.001 |
| Students | 1.44 | (0.97-2.13) | 0.071 | 0.36 | (0.21-0.62) | <0.001 | 0.48 | (0.26-0.90) | 0.021 |
| ***Annual household income*** | | | | | | | | | |
| £0-5,475 | 2.46 | (1.41-4.30) | 0.002 | 2.00 | (1.20-3.34) | 0.008 | 6.85 | (4.01-11.70) | <0.001 |
| £5,476-12,097 | 1.98 | (1.21-3.23) | 0.007 | 2.98 | (1.98-4.48) | <0.001 | 4.86 | (2.98-7.92) | <0.001 |
| £12,098-20,753 | 1.31 | (0.78-2.20) | 0.303 | 1.54 | (1.02-2.34) | 0.040 | 3.72 | (2.32-5.97) | <0.001 |
| £20,754-31,494 | 1.42 | (0.85-2.37) | 0.180 | 1.30 | (0.83-2.04) | 0.252 | 1.64 | (0.89-3.01) | 0.113 |
| £31,495 or more | 1.00 | | | 1.00 | | | 1.00 | | |
| ***Debt*** | 2.56 | (1.77-3.69) | <0.001 | 0.88 | (0.60-1.29) | 0.510 | 2.41 | (1.65-3.52) | <0.001 |
| ***Benefits[b]*** | 1.88 | (1.34-2.65) | <0.001 | 0.91 | (0.63-1.30) | 0.592 | 2.78 | (1.98-3.90) | <0.001 |

"No identified illness" represents the reference category in the multinomial regression (n=1192).

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

### 3.5.2 Common mental disorder symptoms and physical comorbidity

#### 3.5.2.1 Cross tabulations

Given that the CMDS group was the largest subgroup of mental illness symptoms contributing to the MIS category, the socio-demographic and socio-economic the CMDS-physical comorbidity distributions were similar to that of MIS-physical comorbidity (Table 17). Socio-demographic characteristics of those reporting higher levels of CMDS-physical comorbidity included female gender, later middle age (50-59), previously in relationship, Black Caribbean ethnicity and longer UK residing migrants. Those of socio-economically disadvantaged statuses also reported more comorbidity. All of the socio-demographic and socio-economic distributions were statistically significant.

#### 3.5.2.2 Unadjusted associations

The unadjusted relative risks of placement in the CMDS-physical comorbidity group for all socio-demographic and socio-economic characteristics were near identical to those of placement in the MIS-physical comorbidity group (Table 18). Thus, those at elevated relative risk of placement in the CMDS-physical comorbidity category included women, those of older age, those previously in relationship, longer UK residing migrants and those reporting socio-economic disadvantage by all socio-economic indicators. Black African ethnicity, recent migration status and students were associated with lower relative risk of placement in the MIS-physical comorbidity category.

Table 17 Socio-demographic and socio-economic distribution of common mental disorder symptoms and physical comorbidity (N=1679)

| | N | n % (95% confidence intervals) | | | | | | | | *p* |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **No identified illness** | | **Non-comorbid CMDS** | | **Non-comorbid physical illness** | | **CMDS-physical comorbidity** | | |
| ***Gender*** | | | | | | | | | | <0.001 |
| Male | 730 | 397 | 50.3 (46.6-54.0) | 73 | 9.1 (7.3-11.3) | 188 | 29.7 (26.2-33.4) | 72 | 10.9 (8.7-13.6) | |
| Female | 950 | 442 | 42.8 (39.7-46.1) | 131 | 12.8 (10.8-15.1) | 226 | 27.5 (24.5-30.7) | 151 | 16.9 (14.5-19.6) | |
| ***Age*** | | | | | | | | | | <0.001 |
| 16-29 | 574 | 360 | 61.4 (57.1-65.4) | 103 | 18.7 (15.6-22.3) | 67 | 11.8 (9.4-14.7) | 44 | 8.1 (6.0-10.8) | |
| 30-39 | 346 | 217 | 62.3 (56.8-67.5) | 39 | 11.1 (8.1-15.0) | 58 | 16.8 (13.2-21.1) | 32 | 9.9 (6.8-14.0) | |
| 40-49 | 304 | 146 | 46.4 (40.6-52.3) | 34 | 11.5 (8.3-15.7) | 74 | 24.3 (19.8-29.6) | 50 | 17.8 (13.6-22.9) | |
| 50-59 | 212 | 67 | 30.3 (24.2-37.2) | 20 | 9.5 (6.2-14.5) | 74 | 34.9 (28.4-42.0) | 51 | 25.2 (19.5-32.0) | |
| 60 or over | 244 | 49 | 19.2 (14.8-24.6) | 8 | 3.9 (1.9-7.6) | 141 | 58.0 (51.7-64.0) | 46 | 18.9 (14.2-24.7) | |
| ***Relationship status*** | | | | | | | | | | <0.001 |
| Married/cohabitating | 779 | 394 | 46.4 (42.6-50.2) | 69 | 8.3 (6.5-10.5) | 225 | 32.6 (29.1-36.3) | 91 | 12.7 (10.2-15.6) | |
| Single | 668 | 373 | 52.8 (48.9-56.8) | 109 | 16.3 (13.6-19.3) | 110 | 18.1 (15.1-21.6) | 77 | 12.8 (10.3-15.8) | |
| Previously in relationship | 232 | 72 | 27.6 (22.2-33.8) | 26 | 10.7 (7.2-15.5) | 79 | 36.8 (30.5-43.6) | 55 | 25.0 (19.5-31.3) | |
| ***Ethnicity*** | | | | | | | | | | 0.018 |
| White | 1043 | 493 | 42.7 (39.6-45.9) | 133 | 11.9 (10.0-14.1) | 275 | 30.2 (27.1-33.4) | 142 | 15.2 (12.9-17.8) | |
| Black Caribbean | 140 | 68 | 44.5 (36.2-53.2) | 19 | 12.4 (7.7-19.4) | 28 | 21.4 (15.0-29.4) | 25 | 21.7 (15.2-30.0) | |
| Black African | 230 | 137 | 56.0 (49.0-62.7) | 24 | 10.5 (6.9-15.6) | 50 | 24.9 (18.9-32.0) | 19 | 8.7 (5.4-13.6) | |
| Other | 265 | 140 | 47.5 (41.1-54.1) | 28 | 10.5 (7.3 14.9) | 61 | 26.9 (21.4-33.2) | 36 | 15.1 (11.0-20.3) | |
| ***Migrant*** | | | | | | | | | | <0.001 |
| UK born | 1003 | 481 | 43.7 (40.4-47.0) | 135 | 12.6 (10.7-14.9) | 251 | 29.0 (26.0-32.3) | 136 | 14.7 (12.4-17.2) | |
| <10 years in the UK | 311 | 208 | 64.1 (58.1-69.6) | 35 | 12.0 (8.6-16.5) | 46 | 15.8 (11.9-20.7) | 22 | 8.1 (5.2-12.6) | |
| ≥10 years in the UK | 330 | 128 | 34.3 (29.2-39.8) | 30 | 8.3 (5.8-11.8) | 110 | 36.1 (30.6-42.0) | 62 | 21.2 (16.8-26.5) | |
| ***Education*** | | | | | | | | | | <0.001 |
| No qualifications | 224 | 64 | 24.9 (19.7-30.9) | 21 | 8.1 (5.2-12.4) | 90 | 44.2 (37.5-51.2) | 49 | 22.8 (17.5-29.1) | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GCSE | 326 | 143 | 38.3 | (32.9-43.9) | 46 | 12.7 | (9.4-16.9) | 78 | 28.9 | (23.7-34.8) | 59 | 20.1 | (15.9-25.2) | |
| A-level | 424 | 228 | 50.9 | (46.1-55.8) | 61 | 14.8 | (11.6-18.6) | 86 | 21.5 | (17.7-26.0) | 49 | 12.7 | (9.7-16.5) | |
| Degree or above | 687 | 398 | 54.9 | (51.1-58.7) | 76 | 11.0 | (8.8-13.6) | 154 | 24.7 | (21.5-28.2) | 59 | 9.4 | (7.3-12.1) | |
| ***Employment status[a]*** | | | | | | | | | | | | | | <0.001 |
| Working | 975 | 546 | 53.2 | (49.9-56.5) | 118 | 12.1 | (10.1-14.4) | 214 | 23.8 | (21.0-26.7) | 97 | 10.9 | (9.0-13.3) | |
| Not working | 490 | 148 | 26.3 | (22.6-30.4) | 51 | 9.3 | (7.0-12.1) | 178 | 40.7 | (36.1-45.5) | 113 | 23.7 | (19.9-28.0) | |
| Students | 206 | 139 | 66.7 | (59.5-73.3) | 35 | 17.3 | (12.5-23.3) | 22 | 11.0 | (7.1-16.5) | 10 | 5.0 | (2.7-9.2) | |
| ***Annual household income*** | | | | | | | | | | | | | | <0.001 |
| £0-5,475 | 137 | 45 | 30.1 | (23.1-38.1) | 23 | 14.3 | (9.4-21.1) | 29 | 25.0 | (17.9-33.8) | 40 | 30.6 | (23.0-39.5) | |
| £5,476-12,097 | 210 | 75 | 30.2 | (24.3-36.9) | 25 | 10.9 | (7.3-15.8) | 70 | 38.7 | (31.7-46.2) | 40 | 20.3 | (15.0-26.7) | |
| £12,098-20,753 | 203 | 91 | 40.4 | (33.7-47.5) | 22 | 10.2 | (6.7-15.3) | 50 | 27.1 | (21.1-34.1) | 40 | 22.2 | (16.7-28.8) | |
| £20,754-31,494 | 176 | 94 | 48.4 | (40.3-56.6) | 24 | 13.0 | (8.6-19.2) | 42 | 27.7 | (20.9-35.8) | 16 | 10.8 | (6.6-17.4) | |
| £31,495 or more | 698 | 406 | 56.0 | (52.2-59.8) | 80 | 11.4 | (9.2-14.0) | 154 | 24.0 | (20.8-27.6) | 58 | 8.6 | (6.6-11.1) | |
| ***Debt*** | | | | | | | | | | | | | | <0.001 |
| No | 1369 | 716 | 47.2 | (44.4-50.1) | 146 | 10.3 | (8.7-12.1) | 350 | 29.4 | (26.8-32.2) | 157 | 13.1 | (11.2-15.3) | |
| Yes | 292 | 119 | 38.4 | (32.8-44.4) | 55 | 17.8 | (13.8-22.6) | 56 | 20.7 | (16.1-26.2) | 62 | 23.1 | (18.2-28.8) | |
| ***Benefits[b]*** | | | | | | | | | | | | | | <0.001 |
| No | 1339 | 698 | 47.4 | (44.6-50.2) | 149 | 10.7 | (9.0-12.5) | 348 | 30.0 | (27.3-32.8) | 144 | 12.0 | (10.2-14.1) | |
| Yes | 333 | 136 | 36.9 | (31.7-42.4) | 55 | 15.4 | (12.0-19.6) | 63 | 21.0 | (16.6-26.3) | 79 | 26.7 | (21.9 32.1) | |

Cell counts may not add up due to missing values.

*p*-values indicate significance from $\chi^2$ tests with Rao & Scott corrections.

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

Table 18 Unadjusted multinomial regression analysis estimating associations between CMDS-physical comorbidity categories and socio-demographic and socio-economic indicators

| | Unadjusted relative risk ratio (95% confidence intervals) *p* | | | | | |
|---|---|---|---|---|---|---|
| | **Non-comorbid CMDS** | | **Non-comorbid physical illness** | | **CMDS-physical comorbidity** | |
| ***Female*** | 1.66 (1.22-2.26) | 0.001 | 1.09 (0.86-1.38) | 0.497 | 1.82 (1.33-2.48) | <0.001 |
| ***Age*** | | | | | | |
| 16-29 | 1.00 | | 1.00 | | 1.00 | |
| 30-39 | 0.58 (0.38-0.89) | 0.012 | 1.40 (0.95-2.06) | 0.086 | 1.20 (0.71-2.01) | 0.497 |
| 40-49 | 0.81 (0.52-1.26) | 0.352 | 2.73 (1.85-4.03) | <0.001 | 2.90 (1.80-4.67) | <0.001 |
| 50-59 | 1.03 (0.58-1.82) | 0.918 | 5.99 (3.87-9.27) | <0.001 | 6.29 (3.82-10.36) | <0.001 |
| 60 or over | 0.66 (0.30-1.45) | 0.303 | 15.70 (10.40-23.71) | <0.001 | 7.45 (4.35-12.76) | <0.001 |
| ***Relationship status*** | | | | | | |
| Married/cohabitating | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.71 (1.22-2.41) | 0.002 | 0.49 (0.37-0.65) | <0.001 | 0.89 (0.62-1.28) | 0.516 |
| Previously in relationship | 2.15 (1.26-3.68) | 0.005 | 1.90 (1.30-2.77) | 0.001 | 3.31 (2.11-5.20) | <0.001 |
| ***Ethnicity*** | | | | | | |
| White | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.00 (0.55-1.82) | 0.988 | 0.68 (0.42-1.09) | 0.110 | 1.37 (0.82-2.29) | 0.223 |
| Black African | 0.67 (0.40-1.11) | 0.122 | 0.63 (0.43-0.93) | 0.020 | 0.44 (0.25-0.76) | 0.004 |
| Other | 0.79 (0.50-1.26) | 0.328 | 0.80 (0.56-1.15) | 0.226 | 0.89 (0.58-1.38) | 0.608 |
| ***Migrant*** | | | | | | |
| UK born | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 0.65 (0.42-0.99) | 0.046 | 0.37 (0.26-0.54) | <0.001 | 0.38 (0.22-0.64) | <0.001 |
| ≥10 years in the UK | 0.84 (0.53-1.32) | 0.444 | 1.58 (1.15-2.17) | 0.005 | 1.84 (1.26-2.68) | 0.002 |
| ***Education*** | | | | | | |
| No qualifications | 1.63 (0.91-2.91) | 0.097 | 3.95 (2.70-5.78) | <0.001 | 5.35 (3.29-8.68) | <0.001 |
| GCSE | 1.66 (1.07-2.59) | 0.024 | 1.68 (1.18-2.38) | 0.004 | 3.07 (2.00-4.71) | <0.001 |
| A-level | 1.45 (1.00-2.11) | 0.050 | 0.94 (0.69-1.28) | 0.695 | 1.46 (0.95-2.26) | 0.087 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Degree or above | 1.00 | | 1.00 | | 1.00 | |
| ***Employment status[a]*** | | | | | | |
| Working | 1.00 | | 1.00 | | 1.00 | |
| Not working | 1.55 (1.06-2.28) | 0.025 | 3.46 (2.62-4.58) | <0.001 | 4.37 (3.09-6.20) | <0.001 |
| Students | 1.14 (0.74-1.76) | 0.557 | 0.37 (0.22-0.61) | <0.001 | 0.37 (0.18-0.74) | 0.005 |
| ***Annual household income*** | | | | | | |
| £0-5,475 | 2.33 (1.31-4.13) | 0.004 | 1.94 (1.17-3.20) | 0.010 | 6.66 (3.92-11.31) | <0.001 |
| £5,476-12,097 | 1.77 (1.05-2.98) | 0.032 | 2.99 (2.01-4.44) | <0.001 | 4.39 (2.68-7.19) | <0.001 |
| £12,098-20,753 | 1.24 (0.72-2.14) | 0.429 | 1.56 (1.05-2.34) | 0.030 | 3.59 (2.23-5.79) | <0.001 |
| £20,754-31,494 | 1.33 (0.77-2.29) | 0.310 | 1.34 (0.86-2.06) | 0.193 | 1.47 (0.77-2.80) | 0.247 |
| £31,495 or more | 1.00 | | 1.00 | | 1.00 | |
| ***Debt*** | 2.13 (1.45-3.12) | <0.001 | 0.86 (0.61-1.23) | 0.424 | 2.17 (1.48-3.17) | <0.001 |
| ***Benefits[b]*** | 1.85 (1.28-2.68) | 0.001 | 0.90 (0.64-1.28) | 0.560 | 2.86 (2.03-4.04) | <0.001 |

"No identified illness" represents the reference category in the multinomial regression (n=1192).

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

### 3.5.3 Psychotic symptoms-physical comorbidity

#### 3.5.3.1 Cross-tabulation

The prevalence distribution of PS-physical comorbidity was statistically significant by all socio-demographic and socio-economic indicators (Table 19). PS-physical comorbidity was more prevalent among women, the older age groups, the previously in relationship group, those of Black Caribbean ethnicity, and longer UK residing migrants. Comorbidity was also more common among all of the socio-economically disadvantaged groups indicated by low education, non-working employment status, low household income, debt and benefits receipt.

#### 3.5.3.2 Unadjusted multinomial regression analyses

Relative to “no identified illness”, the sociodemographic characteristics associated with elevated risk of placement in the PS-physical comorbidity category were older age, being previously in relationship, Black Caribbean ethnicity, and longer UK residing migrants (Table 20). All socio-economic indicators of disadvantage were associated with greater relative risk of placement in the comorbidity category. Particularly strong associations were found for education and income where those in the most disadvantaged categories were at over 14 times elevated relative risk of placement in the comorbidity category.

The Black African and especially the Black Caribbean ethnic groups were at elevated relative risk of non-comorbid PS. Those of single relationship status were also at elevated relative risk of non-comorbid PS, as were migrants regardless of length of UK residence, students, as well as those who reported socio-economic disadvantage on any SES indicator. Women and those aged 30-39 and 50 or over were at lower relative risk of non-comorbid PS.

Non-comorbid physical illness was associated with older age, being previously in relationship, longer UK residing migrant status, and lower education, non-working employment status and lower income. Groups at lower relative risk of non-comorbid physical illness included those reporting single relationship status, Black African ethnicity, recent migration, and students.

Table 19 Socio-demographic and socio-economic prevalence distribution of psychotic symptoms and physical comorbidity (N=1684)

| | | n % (95% confidence intervals) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | **No identified illness** | | **Non-comorbid PS** | | **Non-comorbid physical illness** | | **PS-physical comorbidity** | | *p* |
| ***Gender*** | | | | | | | | | | 0.035 |
| Male | 734 | 425 | 53.6 (49.8-57.2) | 48 | 5.9 (4.5-7.8) | 232 | 36.5 (32.9-40.2) | 29 | 4.1 (2.8-5.8) | |
| Female | 950 | 536 | 52.2 (48.8-55.5) | 38 | 3.6 (2.5-5.0) | 323 | 38.3 (35.1-41.6) | 53 | 6.0 (4.6-7.8) | |
| ***Age*** | | | | | | | | | | <0.001 |
| 16-29 | 576 | 414 | 71.5 (67.5-75.2) | 50 | 8.5 (6.4-11.2) | 95 | 17.0 (14.1-20.3) | 17 | 3.0 (1.9-4.8) | |
| 30-39 | 347 | 243 | 69.6 (64.3-74.5) | 14 | 3.8 (2.3-6.4) | 81 | 24.0 (19.5-29.2) | 9 | 2.5 (1.3-4.9) | |
| 40-49 | 306 | 166 | 53.4 (47.5-59.3) | 16 | 4.7 (2.8-7.8) | 104 | 34.6 (29.3-40.4) | 20 | 7.2 (4.7-11.0) | |
| 50 or over | 455 | 138 | 28.8 (24.7-33.2) | 6 | 1.1 (0.5-2.6) | 275 | 62.4 (57.7-66.8) | 36 | 7.7 (5.4-10.8) | |
| ***Relationship status*** | | | | | | | | | | <0.001 |
| Married/cohabitating | 780 | 442 | 52.3 (48.3-56.2) | 22 | 2.5 (1.6-3.8) | 290 | 41.4 (37.6-45.4) | 26 | 3.8 (2.5-5.8) | |
| Single | 673 | 429 | 61.6 (57.5-65.5) | 56 | 7.6 (5.8-9.9) | 157 | 26.2 (22.7-29.9) | 31 | 4.7 (3.3-6.6) | |
| Previously in relationship | 231 | 90 | 35.7 (29.6-42.4) | 8 | 2.7 (1.3-5.5) | 108 | 51.0 (44.2-57.7) | 25 | 10.6 (7.2 15.5) | |
| ***Ethnicity*** | | | | | | | | | | <0.001 |
| White | 1045 | 592 | 51.9 (48.6-55.2) | 36 | 2.8 (1.9-4.1) | 371 | 40.6 (37.4-44.0) | 46 | 4.7 (3.4-6.3) | |
| Black Caribbean | 142 | 71 | 46.2 (38.0-54.6) | 18 | 11.2 (6.9-17.7) | 41 | 32.4 (25.1-40.8) | 12 | 10.1 (5.6-17.6) | |
| Black African | 230 | 142 | 59.4 (52.4-66.0) | 19 | 7.1 (4.6-10.9) | 60 | 29.2 (23.1-36.2) | 9 | 4.3 (2.2-8.2) | |
| Other | 265 | 156 | 54.1 (47.5 60.7) | 12 | 4.0 (2.1-7.4) | 83 | 35.8 (29.7 42.5) | 14 | 6.0 (3.5-10.1) | |
| ***Migrant*** | | | | | | | | | | <0.001 |
| UK born | 1009 | 577 | 52.9 (49.5-56.3) | 43 | 3.4 (2.4-4.8) | 341 | 38.8 (35.5-42.1) | 48 | 4.9 (3.7-6.5) | |
| <10 years in the UK | 312 | 220 | 68.4 (62.3-73.9) | 24 | 7.7 (5.2-11.3) | 58 | 19.8 (15.3-25.2) | 10 | 4.1 (2.1-7.9) | |
| ≥10 years in the UK | 327 | 139 | 38.2 (32.8-43.9) | 18 | 4.6 (2.8-7.3) | 147 | 49.4 (43.6-55.3) | 23 | 7.8 (5.2-11.7) | |
| ***Education*** | | | | | | | | | | <0.001 |
| No qualifications | 223 | 72 | 28.5 (22.9-34.8) | 12 | 4.2 (2.3-7.6) | 114 | 55.4 (48.6-62.1) | 25 | 11.8 (7.9-17.3) | |
| GCSE | 328 | 168 | 45.5 (39.8-51.2) | 22 | 5.5 (3.6-8.3) | 122 | 44.3 (38.6-50.2) | 16 | 4.7 (2.9-7.6) | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-level | 424 | 253 | 58.0 | (53.0-62.9) | 37 | 8.0 | (5.8-11.0) | 110 | 27.9 | (23.6-32.7) | 24 | 6.1 (4.1-9.1) |
| Degree or above | 690 | 463 | 64.4 | (60.6-68.0) | 14 | 1.6 | (0.9-2.7) | 200 | 32.1 | (28.6-35.9) | 13 | 1.9 (1.1-3.3) |
| ***Employment status[a]*** | | | | | | | | | | | | <0.001 |
| Working | 980 | 631 | 62.0 | (58.7 65.2) | 37 | 3.3 | (2.3 4.7) | 282 | 31.4 | (28.3 34.7) | 30 | 3.3 (2.3 4.8) |
| Not working | 488 | 172 | 31.5 | (27.4 35.9) | 27 | 4.2 | (2.8 6.1) | 243 | 55.2 | (50.5 59.8) | 46 | 9.1 (6.8 12.2) |
| Students | 207 | 154 | 74.4 | (67.4 80.3) | 20 | 9.3 | (6.1 14.1) | 28 | 13.6 | (9.3 19.4) | 5 | 2.7 (1.1 6.4) |
| ***Annual household income*** | | | | | | | | | | | | <0.001 |
| £0-5,475 | 137 | 58 | 39.1 | (31.3-47.5) | 10 | 5.3 | (2.8-9.7) | 54 | 45.6 | (37.2-54.2) | 15 | 10.0 (6.0-16.3) |
| £5,476-12,097 | 208 | 86 | 35.7 | (29.3-42.6) | 13 | 5.3 | (3.0-9.1) | 93 | 50.6 | (43.4-57.9) | 16 | 8.4 (5.1-13.4) |
| £12,098-20,753 | 203 | 106 | 47.8 | (40.8-55.0) | 7 | 2.8 | (1.3-5.9) | 74 | 40.9 | (33.9-48.3) | 16 | 8.4 (5.3-13.3) |
| £20,754-31,494 | 178 | 111 | 57.8 | (49.8-65.5) | 9 | 3.9 | (2.0-7.5) | 52 | 34.9 | (27.5-43.1) | 6 | 3.4 (1.4-7.7) |
| £31,495 or more | 701 | 463 | 63.9 | (60.1-67.6) | 25 | 3.4 | (2.2-5.2) | 203 | 31.5 | (28.0-35.3) | 10 | 1.1 (0.6-2.1) |
| ***Debt*** | | | | | | | | | | | | <0.001 |
| No | 1372 | 810 | 54.1 | (51.2-57.0) | 55 | 3.5 | (2.6-4.6) | 456 | 38.2 | (35.4-41.1) | 51 | 4.2 (3.1-5.6) |
| Yes | 292 | 144 | 47.6 | (41.5-53.7) | 31 | 8.9 | (6.2-12.7) | 89 | 33.5 | (28.0-39.5) | 28 | 10.0 (6.8-14.3) |
| ***Benefits[b]*** | | | | | | | | | | | | <0.001 |
| No | 1343 | 790 | 54.2 | (51.3-57.2) | 60 | 3.8 | (2.9-5.1) | 443 | 37.9 | (35.0-40.8) | 50 | 4.1 (3.0-5.5) |
| Yes | 333 | 166 | 46.2 | (40.6-51.9) | 26 | 6.4 | (4.4-9.3) | 109 | 37.0 | (31.6-42.6) | 32 | 10.4 (7.4-14.5) |

Cell counts may not add up due to missing values.

*p*-values indicate significance from $\chi^2$ tests with Rao & Scott corrections.

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

Table 20 Unadjusted multinomial regression analysis estimating associations between PS-physical comorbidity categories and socio-demographic and socio-economic indicators

| | Unadjusted relative risk ratio (95% confidence intervals) *p* | | | | | |
|---|---|---|---|---|---|---|
| | **Non-comorbid PS** | | **Non-comorbid physical illness** | | **PS-physical comorbidity** | |
| ***Female*** | 0.62 (0.39-0.97) | 0.037 | 1.08 (0.87-1.33) | 0.483 | 1.52 (0.95-2.42) | 0.083 |
| ***Age*** | | | | | | |
| 16-29 | 1.00 | | 1.00 | | 1.00 | |
| 30-39 | 0.46 (0.25-0.87) | 0.016 | 1.45 (1.03-2.05) | 0.031 | 0.87 (0.37-2.02) | 0.742 |
| 40-49 | 0.74 (0.40-1.38) | 0.347 | 2.73 (1.94-3.85) | <0.001 | 3.21 (1.60-6.41) | 0.001 |
| 50 or over | 0.33 (0.13-0.82) | 0.017 | 9.14 (6.76-12.36) | <0.001 | 6.35 (3.37-11.95) | <0.001 |
| ***Relationship status*** | | | | | | |
| Married/cohabitating | 1.00 | | 1.00 | | 1.00 | |
| Single | 2.61 (1.53-4.44) | <0.001 | 0.54 (0.42-0.69) | <0.001 | 1.04 (0.59-1.84) | 0.901 |
| Previously in relationship | 1.58 (0.64-3.89) | 0.319 | 1.80 (1.28-2.53) | <0.001 | 4.06 (2.14-7.68) | <0.001 |
| ***Ethnicity*** | | | | | | |
| White | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 4.49 (2.27-8.89) | <0.001 | 0.90 (0.60-1.34) | 0.596 | 2.44 (1.17-5.10) | 0.018 |
| Black African | 2.21 (1.20-4.06) | 0.011 | 0.63 (0.44-0.90) | 0.010 | 0.81 (0.38-1.76) | 0.598 |
| Other | 1.37 (0.64-2.95) | 0.414 | 0.85 (0.61-1.16) | 0.302 | 1.24 (0.64-2.38) | 0.521 |
| ***Migrant*** | | | | | | |
| UK born | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.74 (1.00-3.05) | 0.052 | 0.40 (0.28-0.56) | <0.001 | 0.64 (0.29-1.40) | 0.263 |
| ≥10 years in the UK | 1.84 (0.99-3.44) | 0.054 | 1.77 (1.33-2.35) | <0.001 | 2.21 (1.26-3.87) | 0.006 |
| ***Education*** | | | | | | |
| No qualifications | 5.94 (2.54-13.92) | <0.001 | 3.90 (2.75-5.53) | <0.001 | 14.19 (6.72-30.00) | <0.001 |
| GCSE | 4.83 (2.41-9.70) | <0.001 | 1.96 (1.45-2.64) | <0.001 | 3.55 (1.64-7.70) | 0.001 |
| A-level | 5.52 (2.86-10.66) | <0.001 | 0.96 (0.72-1.28) | 0.801 | 3.60 (1.74-7.43) | <0.001 |
| Degree or above | 1.00 | | 1.00 | | 1.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Employment status[a]*** | | | | | | |
| Working | 1.00 | | 1.00 | | 1.00 | |
| Not working | 2.50 (1.43-4.36) | 0.001 | 3.46 (2.68-4.46) | <0.001 | 5.45 (3.24-9.14) | 0.001 |
| Students | 2.37 (1.33-4.22) | 0.004 | 0.36 (0.23-0.57) | <0.001 | 0.69 (0.26-1.85) | 0.461 |
| ***Annual household income*** | | | | | | |
| £0-5,475 | 2.54 (1.12-5.76) | 0.025 | 2.37 (1.57-3.57) | <0.001 | 14.42 (6.09-34.14) | <0.001 |
| £5,476-12,097 | 2.78 (1.36-5.67) | 0.005 | 2.88 (2.02-4.10) | <0.001 | 13.17 (5.65-30.71) | <0.001 |
| £12,098-20,753 | 1.12 (0.45-2.76) | 0.813 | 1.73 (1.21-2.47) | 0.003 | 9.90 (4.31-22.74) | <0.001 |
| £20,754-31,494 | 1.27 (0.55-2.91) | 0.574 | 1.22 (0.83-1.80) | 0.305 | 3.27 (1.10-9.70) | 0.033 |
| £31,495 or more | 1.00 | | 1.00 | | 1.00 | |
| ***Debt*** | 2.93 (1.76-4.86) | <0.001 | 1.00 (0.74-1.35) | 0.979 | 2.69 (1.58-4.56) | <0.001 |
| ***Benefits[b]*** | 1.95 (1.18-3.25) | 0.010 | 1.15 (0.86-1.52) | 0.345 | 3.00 (1.81-5.00) | <0.001 |

"No identified illness" represents the reference category in the multinomial regression (n=1192).

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

## 3.6 Results of aim 1.3: Independent socio-demographic and socio-economic effects on comorbidity

### 3.6.1 Mental illness symptoms-physical comorbidity

Table 21 shows the socio-demographic and socio-economic associations with the MIS-comorbidity variable after adjusting for explanatory factors. Women and older age groups were socio-demographic characteristics which remained associated with elevated relative risk of MIS-physical comorbidity. The relative risk of comorbidity for the previously in relationship group was attenuated from an unadjusted relative risk of 3.33 ($p$<0.001) to 1.29 ($p$=0.332) after adjustment. Age made the largest contribution to this attenuation, followed by stressful life events and self-rated health (analyses not shown). After adjustment there were no differences by ethnicity and migrant status; the unadjusted protective effects of Black African ethnicity and more recent migrants were driven by younger age, while the risk associated with longer stay in the UK among migrants was explained by older age (analyses not shown). The protective effects of Black African ethnicity and recent migrant status were not confounded by each other, as an equal proportion of those self-identifying as Black African were recent and longer UK residing migrants (approximately 40%), and the largest ethnic group represented in the recent migrant group was White ethnicity (42% vs. >28% for all other ethnic groups, analyses not shown). Education, household income and employment remained associated with comorbidity such that indicators of lower SES were associated with greater relative risk of placement in the comorbidity category, while debt and benefits receipt were not associated with comorbidity after adjusting for explanatory factors. The relative risk of comorbidity increased with age (test for trend, p=0.02), and decreased with higher household income (test for trend, $p$=0.05), but there was no significant trend by education ($p$=0.078).

The distribution of comorbidity by education went from an unadjusted linear trend to an inverse U-shaped trend. Effect sizes for the GSCE group was larger, but not statistically different from the no qualifications and A-level categories ($p$>0.05, analyses not shown). This was driven by CMDS-physical comorbidity associations, and the pattern was caused by selective confounding of age on

the association between no qualifications and MIS-physical comorbidity, particularly among younger respondents (<40 years; see section 3.5.2).

The effect sizes indicating the relative risk of placement in the MIS-physical comorbidity category for longer UK residing migrants, low education, non-working employment status, low household income and benefits receipt were larger than the effect sizes indicating the relative risk of placement in either of the non-comorbid categories. However, post-hoc comparisons between MIS-physical comorbidity *vs* non-comorbid physical illness and MIS-physical comorbidity *vs* non-comorbid mental illness indicated that the associations were not statistically different by any SES indicators or migrant status ($p>0.05$; analyses not shown).

In contrast, ethnic minority groups were not at elevated risk of comorbidity, relative to either of the non-comorbidity groups. In fact, those reporting Black African ethnicity were at lower risk of reporting comorbidity, relative to non-comorbid physical illness ($p=0.042$; analyses not shown).

Those reporting GCSE qualifications, non-working employment and household incomes ranging from £5,476 to £12,097 were the socio-economically disadvantaged groups at elevated relative risk of non-comorbid physical illness, and those reporting GCSE or A-level qualifications and debt were at elevated risk of placement in the non-comorbid MIS group.

Table 21 Adjusted multinomial regression analysis estimating associations between MIS-physical comorbidity categories and socio-demographic and socio-economic indicators

| | Adjusted relative risk ratio (95% confidence intervals) *p* | | | | | |
|---|---|---|---|---|---|---|
| | **Non-comorbid MIS** | | **Non-comorbid physical illness** | | **MIS-physical comorbidity** | |
| ***Female*** | 1.62 (1.19-2.20) | 0.002 | 1.09 (0.82-1.45) | 0.560 | 2.09 (1.43-3.06) | <0.001 |
| ***Age*** | | | | | | |
| 16-29 | 1.00 | | 1.00 | | 1.00 | |
| 30-39 | 0.53 (0.35-0.79) | 0.002 | 1.50 (1.00-2.25) | 0.048 | 1.21 (0.71-2.07) | 0.484 |
| 40-49 | 0.67 (0.43-1.03) | 0.068 | 2.58 (1.69-3.92) | <0.001 | 2.03 (1.16-3.58) | 0.014 |
| 50-59 | 0.69 (0.38-1.23) | 0.207 | 5.32 (3.36-8.42) | <0.001 | 3.92 (2.24-6.86) | <0.001 |
| 60 or over | 0.54 (0.25-1.19) | 0.129 | 14.93 (9.49-23.49) | <0.001 | 5.62 (3.01-10.51) | <0.001 |
| ***Relationship status*** | | | | | | |
| Married/cohabitating | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.45 (0.99-2.12) | 0.058 | 1.21 (0.86-1.70) | 0.279 | 1.30 (0.83-2.05) | 0.249 |
| Previously in relationship | 1.62 (0.92-2.84) | 0.093 | 0.80 (0.51-1.25) | 0.327 | 1.29 (0.77-2.17) | 0.332 |
| ***Ethnicity*** | | | | | | |
| White | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.32 (0.74-2.33) | 0.346 | 0.73 (0.40-1.30) | 0.283 | 0.92 (0.48-1.75) | 0.791 |
| Black African | 1.03 (0.61-1.75) | 0.907 | 1.16 (0.76-1.76) | 0.493 | 0.56 (0.29-1.09) | 0.089 |
| Other | 0.82 (0.50-1.34) | 0.425 | 1.24 (0.83-1.87) | 0.295 | 0.85 (0.50-1.46) | 0.561 |
| ***Migrant*** | | | | | | |
| UK born | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 0.94 (0.61-1.45) | 0.785 | 0.78 (0.50-1.22) | 0.269 | 0.89 (0.51-1.56) | 0.678 |
| ≥10 years in the UK | 1.16 (0.75-1.79) | 0.508 | 1.18 (0.83-1.69) | 0.361 | 1.43 (0.91-2.24) | 0.119 |
| ***Education*** | | | | | | |
| No qualifications | 1.14 (0.59-2.21) | 0.695 | 0.97 (0.60-1.56) | 0.891 | 1.30 (0.71-2.38) | 0.390 |
| GCSE | 1.62 (1.03-2.56) | 0.038 | 1.49 (1.00-2.24) | 0.051 | 1.78 (1.06-2.96) | 0.028 |
| A-level | 1.51 (1.03-2.21) | 0.033 | 1.13 (0.79-1.62) | 0.499 | 1.35 (0.83-2.19) | 0.222 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Degree or above | 1.00 | | | 1.00 | | | 1.00 | |
| ***Employment status[a]*** | | | | | | | | |
| Working | 1.00 | | | 1.00 | | | 1.00 | |
| Not working | 1.38 | (0.91-2.11) | 0.134 | 1.44 | (1.01-2.05) | 0.044 | 1.81 (1.15-2.86) | 0.010 |
| Students | 1.25 | (0.77-2.02) | 0.365 | 1.07 | (0.58-1.96) | 0.839 | 0.83 (0.39-1.77) | 0.631 |
| ***Income*** | | | | | | | | |
| £0-5,475 | 1.44 | (0.76-2.73) | 0.264 | 1.20 | (0.66-2.17) | 0.542 | 1.94 (0.96-3.91) | 0.064 |
| £5,476-12,097 | 1.53 | (0.88-2.66) | 0.133 | 1.62 | (1.00-2.62) | 0.049 | 2.25 (1.25-4.05) | 0.007 |
| £12,098-20,753 | 1.18 | (0.68-2.03) | 0.556 | 1.04 | (0.67-1.64) | 0.850 | 2.09 (1.22-3.57) | 0.007 |
| £20,754-31,494 | 1.28 | (0.76-2.16) | 0.353 | 1.07 | (0.66-1.72) | 0.789 | 1.05 (0.52-2.13) | 0.893 |
| £31,495 or more | 1.00 | | | 1.00 | | | 1.00 | |
| ***Debt*** | 1.91 | (1.27-2.86) | 0.002 | 0.96 | (0.64-1.45) | 0.862 | 1.36 (0.85-2.17) | 0.201 |
| ***Benefits[b]*** | 1.30 | (0.88-1.93) | 0.186 | 0.97 | (0.66-1.41) | 0.859 | 1.45 (0.96-2.20) | 0.080 |

Models adjust for gender and/or age, stressful life events, self-rated health, poor health behaviours, social network size and social support, separately from other variables in the table.
"No identified illness" represents the reference category in the multinomial regression (n=1192).

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

### 3.6.2 Common mental disorders symptoms and physical comorbidity

Fully adjusting the regression models attenuated the strength of the socio-demographic associations with CMDS-comorbidity, but women and those of older age remained at elevated relative risk of placement in the comorbidity category, risk increasing with age (test for trend $p<0.001$, Table 22). Age, stressful life-events and self-rated health drove the attenuation of the association between the previously in relationship group and CMDS-comorbidity from 3.31 ($p<0.001$) to 1.24 ($p=0.418$) (analyses not shown), similar to the associations observed with MIS-comorbidity (3.5.1). The protective effects of Black African ethnicity and recent migration on comorbidity were no longer statistically different from the White ethnic group and UK born, respectively, after adjustment. The higher unadjusted relative risk of comorbidity for longer UK residing migrants was fully attenuated. The changes in effect sizes for ethnicity and migrant status were largely driven by age, and to a lesser extent poor self-rated health (analyses not shown).

Low household income and non-working employment status were the indicators of socio-economic disadvantage which were associated with greater relative risk of comorbidity in the adjusted model, although adjustment attenuated the strength of the associations. While those who were not working remained at greater relative risk of comorbidity, the protective effect of students was rendered non-significant (driven by age, analyses not shown). The inverse gradient between household income and relative risk of placement in the comorbidity category remained (test for trend $p<0.001$). The relative risk of placement in the comorbidity category for those reporting low education, debt and benefits receipt were fully attenuated after adjustment.

The relative risk of comorbidity no longer increased with lower educational qualifications ($p>0.05$), and none of the educational categories were associated with CMDS-physical comorbidity. However, the effect size of the association between GCSE qualifications and CMDS-physical comorbidity was elevated compared to no qualifications and A-level qualifications. This inverse U-shaped pattern was caused by selective confounding of age on the association between “no qualifications” and CMDS-physical comorbidity particularly among the

younger respondents (<40 years), while age did not confound the association between GCSE level education and comorbidity.

Characteristics associated with non-comorbid CMDS were female gender and debt. Those aged 30-39 were at lower risk of non-comorbid CMDS compared to the 16-29 age group. The relative risk of placement in the non-comorbid physical illness category was elevated for the non-working employment status group and those reporting low (but not the lowest) household income, and increased with age (test for trend $p<0.001$).

The effect sizes of the associations between several indicators of vulnerable social statuses and comorbidity were greater than the associations with non-comorbid mental and physical illness. These included longer UK residing migrants, GCSE-educated, non-working, low household income and benefits receipt. However, differences in these associations between the non-comorbid groups and the comorbidity group were not statistically different ($p>0.05$; analyses not shown).

Table 22 Adjusted multinomial regression analysis estimating associations between CMDS-physical comorbidity categories and socio-demographic and socio-economic indicators

| | Adjusted relative risk ratio (95% confidence intervals) *p* | | | | | |
|---|---|---|---|---|---|---|
| | **Non-comorbid CMDS** | | **Non-comorbid physical illness** | | **CMDS-physical comorbidity** | |
| ***Female*** | 2.03 (1.46-2.83) | <0.001 | 1.14 (0.86-1.51) | 0.372 | 2.27 (1.53-3.37) | <0.001 |
| ***Age*** | | | | | | |
| 16-29 | 1.00 | | 1.00 | | 1.00 | |
| 30-39 | 0.60 (0.38-0.93) | 0.021 | 1.51 (1.02-2.24) | 0.039 | 1.46 (0.83-2.55) | 0.188 |
| 40-49 | 0.71 (0.45-1.13) | 0.149 | 2.58 (1.72-3.86) | <0.001 | 2.27 (1.25-4.13) | 0.007 |
| 50-59 | 0.93 (0.52-1.69) | 0.821 | 5.59 (3.58-8.73) | <0.001 | 4.79 (2.68-8.59) | <0.001 |
| 60 or over | 0.63 (0.27-1.49) | 0.293 | 15.14 (9.78-23.42) | <0.001 | 6.29 (3.29-12.00) | <0.001 |
| ***Relationship status*** | | | | | | |
| Married/cohabitating | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.34 (0.88-2.02) | 0.171 | 1.18 (0.85-1.65) | 0.318 | 1.23 (0.77-1.97) | 0.377 |
| Previously in relationship | 1.63 (0.91-2.93) | 0.101 | 0.82 (0.53-1.27) | 0.382 | 1.24 (0.73-2.11) | 0.418 |
| ***Ethnicity*** | | | | | | |
| White | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 0.95 (0.50-1.80) | 0.875 | 0.68 (0.38-1.21) | 0.192 | 0.84 (0.44-1.61) | 0.604 |
| Black African | 0.79 (0.45-1.39) | 0.410 | 1.05 (0.69-1.58) | 0.827 | 0.58 (0.29-1.13) | 0.108 |
| Other | 0.76 (0.46-1.27) | 0.300 | 1.19 (0.80-1.76) | 0.393 | 0.85 (0.48-1.50) | 0.579 |
| ***Migrant*** | | | | | | |
| UK born | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 0.73 (0.46-1.17) | 0.195 | 0.81 (0.53-1.24) | 0.330 | 0.72 (0.39-1.33) | 0.294 |
| ≥10 years in the UK | 0.96 (0.59-1.55) | 0.857 | 1.16 (0.82-1.64) | 0.404 | 1.33 (0.84-2.12) | 0.222 |
| ***Education*** | | | | | | |
| No qualifications | 0.83 (0.40-1.70) | 0.612 | 1.00 (0.63-1.59) | 0.998 | 0.97 (0.52-1.80) | 0.913 |
| GCSE | 1.25 (0.77-2.03) | 0.364 | 1.39 (0.93-2.06) | 0.104 | 1.59 (0.94-2.68) | 0.081 |
| A-level | 1.20 (0.81-1.78) | 0.372 | 1.12 (0.79-1.58) | 0.532 | 1.14 (0.69-1.87) | 0.612 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Degree or above | 1.00 | | 1.00 | | 1.00 | |
| ***Employment status[a]*** | | | | | | |
| Working | 1.00 | | 1.00 | | 1.00 | |
| Not working | 1.17 (0.75-1.84) | 0.480 | 1.44 (1.02-2.02) | 0.038 | 1.62 (1.01-2.60) | 0.046 |
| Students | 1.00 (0.59-1.72) | 0.992 | 1.06 (0.59-1.89) | 0.846 | 0.61 (0.27-1.40) | 0.244 |
| ***Annual household income*** | | | | | | |
| £0-5,475 | 1.42 (0.75-2.70) | 0.280 | 1.20 (0.67-2.14) | 0.537 | 1.85 (0.92-3.70) | 0.083 |
| £5,476-12,097 | 1.33 (0.74-2.40) | 0.343 | 1.66 (1.04-2.66) | 0.034 | 1.87 (1.02-3.42) | 0.043 |
| £12,098-20,753 | 1.11 (0.63-1.95) | 0.718 | 1.09 (0.70-1.68) | 0.712 | 1.93 (1.12-3.34) | 0.018 |
| £20,754-31,494 | 1.19 (0.68-2.08) | 0.538 | 1.11 (0.70-1.76) | 0.672 | 0.91 (0.43-1.93) | 0.811 |
| £31,495 or more | 1.00 | | 1.00 | | 1.00 | |
| ***Debt*** | 1.58 (1.04-2.40) | 0.032 | 0.94 (0.64-1.37) | 0.735 | 1.16 (0.72-1.87) | 0.551 |
| ***Benefits[b]*** | 1.31 (0.85-2.00) | 0.217 | 0.96 (0.66-1.39) | 0.827 | 1.48 (0.96-2.28) | 0.075 |

Models adjust for gender and/or age, stressful life events, self-rated health, poor health behaviours, social network size and social support, separately from other variables in the table.
"No identified illness" represents the reference category in the multinomial regression (n=1192).

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

### 3.6.3 Psychotic symptoms and physical comorbidity

Older age was the only socio-demographic characteristic associated with greater relative risk of placement in the PS-physical comorbidity category after adjustment for explanatory factors (test for trend $p<0.001$) (Table 23). Age, poor self-rated health and stressful life events accounted for the full attenuation for the previously in relationship group, and poor self-rated health fully attenuated the association with Black Caribbean ethnicity (analyses not shown).

The socio-economic indicators which remained significantly at elevated relative risk of comorbidity included lower education and lower household income, the relative risk of comorbidity increasing with lower education and income (tests for trends $p\leq0.014$). In contrast to the associations between education and CMDS-physical comorbidity, the effect sizes for no qualifications and A-level qualifications were larger than the effect size for the GCSE category, suggesting a U-shaped distribution, although the effect sizes for the no qualifications group and the A-level group were not statistically different from the GCSE group ($p\geq0.073$, analyses not shown). The U-shaped pattern was driven by negative confounding of age on the association between the A-level group and PS-comorbidity. In contrast, age exerted no influence on the association between the GCSE and comorbidity association. This confounding pattern was particularly prominent among respondents aged over 35. This effect size pattern also applied to the educational categories' relative risk of placement in both the non-comorbidity categories, but the differences between the GCSE group and no qualifications and A-level qualifications were not statistically different ($p>0.05$, analyses not shown).

Rather than a gradient by household income for the PS-physical comorbidity category, a threshold emerged after adjustment, such that those in the 3 lowest earning household groups (annual income <£20,753) were at substantially elevated risk of placement in the comorbidity category, relative to the reference, while there was no difference between the 2 highest earning household groups. The strong unadjusted association observed between non-working employment and PS-physical comorbidity was fully attenuated after adjustment, with older age, poor self-rated health and small social networks making the largest contributions to the attenuation (analyses not shown). The complete attenuation

of associations between debt and benefits receipt with comorbidity were predominantly driven by poor self-rated health (analyses not shown).

In contrast to the fully attenuated associations with PS-physical comorbidity, the association between Black Caribbean ethnicity and non-comorbid PS was strengthened after adjustment; this negative confounding effect being driven by poor health behaviours which those of Black Caribbean ethnicity were less likely to engage with compared to those of White ethnicity (the proportion reporting neither smoking nor alcohol misuse was 74.93% and 60.79% for the Black Caribbean and White ethnic groups, respectively, analyses not shown). Further, the association between Black African ethnicity and non-comorbid PS was unaffected by the explanatory factors, remaining at over twice the elevated relative risk compared to those of White ethnicity. Migrant status was also associated with elevated risk of non-comorbid PS, especially among longer UK residing migrants. These effects were not accounted for by ethnicity (analyses not shown). In addition, the risk of non-comorbid PS was inversely associated with age (test for trend $p$=0.016, analyses not shown).

Socio-economic indicators associated with non-comorbid PS included lower educational qualifications, non-working employment status, low household income and debt. Indeed, with the exception of household income, the effect sizes of these indicators of socio-economic adversity were larger for the non-comorbid PS category, than the PS-physical comorbidity category. However, relative risks of placement in the non-comorbid PS category by education, employment and debt were not statistically different from the risks of placement in the PS-physical comorbidity category ($p \geq 0.231$, analyses not shown).

Low household income was the only indicator of socio-economic adversity for which the risk of comorbidity was greater than the risk of both of non-comorbid mental and physical illness. The associations between 2 of the low household income categories and comorbidity were statistically greater relative to non-comorbid physical illness (£5,476-12,097 and £12,098-20,753, $p \leq 0.004$), while one of the lower household income categories were statistically greater relative to non-comorbid mental illness (£12,098-20,753, $p=0.010$; analyses no shown).

Non-comorbid physical illness was associated with older age, GCSE-level education, non-working employment status and low household income (£5,476-12,097).

Table 23 Adjusted multinomial regression analysis estimating associations between PS-physical comorbidity categories and socio-demographic and socio-economic indicators

| | Adjusted relative risk ratio (95% confidence intervals) *p* | | | | | |
|---|---|---|---|---|---|---|
| | **Non-comorbid PS** | | **Non-comorbid physical illness** | | **PS-physical comorbidity** | |
| ***Female*** | 0.71 (0.44-1.14) | 0.155 | 1.10 (0.85-1.43) | 0.453 | 1.73 (0.99-3.02) | 0.053 |
| ***Age*** | | | | | | |
| 16-29 | 1.00 | | 1.00 | | 1.00 | |
| 30-39 | 0.45 (0.23-0.88) | 0.019 | 1.60 (1.13-2.28) | 0.009 | 1.02 (0.41-2.53) | 0.964 |
| 40-49 | 0.59 (0.31-1.15) | 0.121 | 2.48 (1.72-3.57) | <0.001 | 2.59 (1.18-5.68) | 0.018 |
| 50 or over | 0.30 (0.12-0.77) | 0.013 | 8.36 (6.04-11.58) | <0.001 | 5.52 (2.73-11.17) | <0.001 |
| ***Relationship status*** | | | | | | |
| Married/cohabitating | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.69 (0.93-3.06) | 0.084 | 1.17 (0.86-1.58) | 0.328 | 1.32 (0.73-2.41) | 0.360 |
| Previously in relationship | 1.40 (0.55-3.54) | 0.479 | 0.79 (0.53-1.16) | 0.226 | 1.43 (0.69-2.94) | 0.333 |
| ***Ethnicity*** | | | | | | |
| White | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 5.23 (2.45-11.15) | <0.001 | 0.80 (0.49-1.30) | 0.361 | 1.71 (0.71-4.12) | 0.234 |
| Black African | 2.51 (1.18-5.35) | 0.017 | 0.97 (0.66-1.42) | 0.867 | 1.20 (0.51-2.83) | 0.679 |
| Other | 1.25 (0.56-2.80) | 0.586 | 1.13 (0.79-1.62) | 0.489 | 1.48 (0.73-2.98) | 0.279 |
| ***Migrant*** | | | | | | |
| UK born | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.82 (0.98-3.37) | 0.057 | 0.82 (0.55-1.22) | 0.326 | 1.31 (0.55-3.10) | 0.537 |
| ≥10 years in the UK | 2.45 (1.31-4.60) | 0.005 | 1.25 (0.91-1.71) | 0.171 | 1.73 (0.90-3.31) | 0.098 |
| ***Education*** | | | | | | |
| No qualifications | 4.37 (1.70-11.19) | 0.002 | 1.01 (0.66-1.56) | 0.953 | 3.17 (1.34-7.50) | 0.009 |
| GCSE | 3.19 (1.51-6.72) | 0.002 | 1.51 (1.06-2.14) | 0.021 | 1.55 (0.65-3.73) | 0.324 |
| A-level | 3.96 (1.99-7.90) | <0.001 | 1.07 (0.77-1.47) | 0.698 | 2.72 (1.28-5.77) | 0.009 |
| Degree or above | 1.00 | | 1.00 | | 1.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Employment status[a]*** | | | | | | |
| Working | 1.00 | | 1.00 | | 1.00 | |
| Not working | 2.32 (1.23-4.39) | 0.010 | 1.50 (1.10-2.05) | 0.010 | 1.92 (0.97-3.78) | 0.061 |
| Students | 1.87 (0.90-3.87) | 0.091 | 0.96 (0.56-1.63) | 0.876 | 1.19 (0.42-3.38) | 0.751 |
| ***Annual household income*** | | | | | | |
| £0-5,475 | 1.31 (0.46-3.77) | 0.614 | 1.27 (0.77-2.10) | 0.354 | 2.99 (1.18-7.54) | 0.021 |
| £5,476-12,097 | 2.47 (1.03-5.93) | 0.043 | 1.58 (1.04-2.40) | 0.032 | 5.96 (2.42-14.71) | <0.001 |
| £12,098-20,753 | 1.05 (0.40-2.75) | 0.919 | 1.12 (0.75-1.67) | 0.570 | 5.27 (2.26-12.32) | <0.001 |
| £20,754-31,494 | 1.18 (0.51-2.74) | 0.697 | 0.96 (0.63-1.46) | 0.833 | 2.27 (0.71-7.27) | 0.165 |
| £31,495 or more | 1.00 | | 1.00 | | 1.00 | |
| ***Debt*** | 2.14 (1.20-3.82) | 0.010 | 0.91 (0.65-1.28) | 0.577 | 1.34 (0.73-2.47) | 0.350 |
| ***Benefits[b]*** | 1.36 (0.74-2.50) | 0.327 | 1.03 (0.75-1.40) | 0.869 | 1.36 (0.75-2.45) | 0.310 |

Models adjust for gender and/or age, childhood and life-time trauma, self-rated health, poor health behaviours, social network size and social support, separately from other variables in the table.

"No identified illness" represents the reference category in the multinomial regression (n=1192).

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.

[b] Benefits are non-health related

## 3.7 Summary of results

### 3.7.1 Aim 1.1: Prevalence of comorbidity

- Overall 16.1% reported MIS-physical comorbidity in the community. Disaggregated by CMDS and PS, 14.9% reported CMDS-physical comorbidity, and 5.3% reported PS-physical comorbidity.
- Comorbidity of both CMDS and PS was not specific to any particular physical illness category, but the prevalence was consistently elevated within physical illness groups.

### 3.7.2 Aim 1.2: Distribution of comorbidity

- Unadjusted socio-demographic associations with comorbidity indicated that MIS-physical comorbidity and CMDS-physical comorbidity were associated with female gender, older age, being previously in relationship, and longer-stay migration status.
- All indicators of socio-economic disadvantage were associated with MIS-, CMDS- and PS-physical comorbidity. Thus, comorbidity was associated with lower educational qualifications, non-working employment status, lower household income, debt and benefits receipt.
- Associations between all socio-economic disadvantage indicators and comorbidity were stronger for PS-physical comorbidity than MIS- or CMDS-physical comorbidity, especially low education and household income.
- Those of Black African ethnicity, recent migrants and students were at lower relative risk of MIS-physical and CMDS-physical comorbidity.

### 3.7.3 Aim 1.3: Independent socio-demographic and socio-economic associations with comorbidity

- Women were at greater relative risk of MIS-physical comorbidity. The finding was driven by women reporting both more non-comorbid and comorbid CMDS symptoms, supporting the H1 and H2 hypotheses.
- The relative risk of all comorbidity outcomes increased with age. This finding was plausibly driven by the increasing relative risk of long-term physical conditions with age, as strong associations between increasing

age and non-comorbid physical illness were also found. These findings supported the H3 and H4 hypotheses.

- There were no differences in risk of placement in any of the comorbidity categories by relationship status, thus lending no support to hypothesis H5.
- There were no differences in risk of comorbidity by ethnicity or migrant status for any category of mental illness symptoms. The findings did not support the H6 or H8 hypotheses, although they did support hypothesis H7 stating that there would be no differences between recent migrants and non-migrants in risk of comorbidity.
- In support of hypothesis H9 low education, non-working employment status and low household income were indicators of socio-economic disadvantage which remained associated with MIS-physical comorbidity after adjustment to explanatory factors. Two of these 3 socio-economic disadvantage indicators remained associated with CMDS-physical and PS-physical comorbidity after adjustment. Low household income was the indicator which was most strongly and consistently associated with comorbidity.
- In contrast to the H9 hypothesis, debt was specifically associated with non-comorbid mental illness symptoms, but not mental-physical comorbidity, and benefits receipt was not associated with any of the comorbidity outcomes.
- Most of the indicators of vulnerable social statuses were at greater relative risk of placement in the MIS- and CMDS-physical comorbidity categories than either of the non-comorbid illness categories, although differences were not statistically significant. The notable exception to these trends was ethnic minority status, which indicated lower risk of placement in the MIS- and CMDS-physical comorbidity groups for all ethnic minority groups. These findings do not support hypothesis H10.
- In contrast to hypothesis H10 most indicators of vulnerable social status were at greater relative risk of placement in the non-comorbid PS category than the PS-physical comorbidity category or the non-comorbid physical category. The only indicator of social vulnerability that supported the H10 hypothesis in the PS analyses was household income, such that

those reporting lower household income were at greater relative risk of placement in the comorbidity category, than either of the non-comorbid categories.

- The most influential explanatory factor on socio-economic associations with comorbidity was self-rated health, and to a lesser extent social network size and social support. Health behaviours and stressful life events had relatively little effect on these associations.

## 3.8 Discussion

Within the South East London community, 1 in 6 people reported mental-physical comorbidity, thus, affecting a substantial proportion of the population. There were distinct SES patterns of comorbidity such that those of lower SES were at elevated risk of comorbidity. These results are consistent with previous research documenting elevated prevalence of comorbidity in more deprived areas [338, 475, 476] and social gradients by income and education in psychiatric and physical multi-morbidity [477–480]. However, this chapter extends this previous literature in providing a detailed description of inequalities in mental-physical comorbidity in both CMDS and PS. The persistent socio-economic patterning of comorbidity suggests that broad social causes are likely to play an important role in the generation and/or perpetuation of comorbidity. The fact that comorbidity was not specific to any particular chronic disease group or mental illness symptom category further suggests that while disease-specific biological or behavioural mechanisms may be morbidity-driven causes of comorbidity, the dominant fundamental causes are more likely to involve broad social determinants.

### 3.8.1 Socio-demographic findings

As expected, older age and female gender were associated with both CMDS- and PS-physical comorbidity (H1a and b), although associations between female gender and CMDS-physical comorbidity were stronger compared to PS-physical comorbidity. This is in line with the literature which shows more consistent associations between female gender and CMDs than with psychotic disorders [51, 72, 265–268].

The results did not uniformly support the H1c hypothesis however, as unadjusted results showed diverging CMDS and PS comorbidity patterns for Black African and Black Caribbean respondents. Prior to adjustment, Black African ethnicity was associated with lower relative risk of CMDS-physical comorbidity, while Black Caribbean ethnicity was associated with greater relative risk of PS-physical comorbidity. The fully adjusted models indicated no differences between ethnic groups.

Whilst the Black Caribbean group was not associated with PS-comorbidity after adjustment to explanatory factors, this group was instead at substantially

elevated relative risk of non-comorbid PS. This association was strengthened by the inclusion of poor health behaviours, and unaffected by the inclusion of important risk factors of PS such as stressful life events, small social network size, and low social support. The association also withstood the inclusion of self-rated health in the model, suggesting that a rather healthy group of Black Caribbean respondents reported experiences of non-comorbid PS. Given that this finding was specific to the Black Caribbean group this may suggests that the PSQ screening tool for PS may be insensitive to Caribbean cultures resulting in spiritual experiences, considered unusual by Western standards, mistakenly being classed as PS. Indeed the most frequently reported PSQ item among the non-comorbid Black Caribbean group was the “strange experience” item, asking about experiences they felt were ”so strange that people would find it very hard to believe” (analyses not shown). This interpretation is also consistent with previous research showing that hallucinatory experiences identified by the PSQ are not necessarily indicative of psychosis, particularly within Black Caribbean groups, compared to those of White ethnicity [481]. These findings might warrant further validation of the PSQ within Black Caribbean populations.

### 3.8.2 Socio-economic findings

The fundamental social cause (FSC) theory [18] provides a useful framework for interpreting the results indicating the strong associations between the socio-economic indicators and CMDS- and PS-physical comorbidity. This theory postulates that resources and exposures are disproportionately distributed such that those of lower SES experience greater health disadvantages. There are 3 major ways in which the socio-economic distribution of resources and exposures may affect comorbidity. First, they may act as upstream causes of comorbidity. Specifically, socio-economic resources may be generic for both mental and physical health and separately affect the risk of developing mental and physical illness, and thus comorbidity. Secondly, the lack of resources may influence the risk of developing a comorbid condition in addition to a pre-existing mental or physical illness. In this case, the vulnerability associated with having a health condition may interact with SES to increase the likelihood of developing a comorbid condition. In other words SES may precipitate comorbidity by affecting the morbidity-driven comorbidity mechanisms operating

between mental and physical illnesses. Given that such mechanisms would need to be sensitive to SES, they are more likely to be driven by mechanisms that are behavioural or psychosocial, rather than purely biological. In the case of CMDS-physical comorbidity, most of the socio-economic variables indicated that the disadvantaged groups were at greater relative risk of placement in the CMDS-physical comorbidity category than the non-comorbid CMDS or physical illness categories. This may be an example of where SES may have a greater influence on morbidity-driven comorbidity mechanisms.

The third explanation relates to perpetuation of comorbidity, in that once developed, comorbidity might be more likely to reoccur and become chronic among lower SES groups. The cross-sectional dataset provides a snap-shot description of those more likely to experience comorbidity at a particular point in time. However, real experiences of mental illness are often characterised by symptoms of fluctuating severity through periods of recovery and relapse [280, 281]. In the context of this study, this means that those with reporting physical illness may continuously fluctuate between comorbidity and non-comorbidity. In terms of recovery and relapse, the snap-shot described in this chapter might indicate that lower SES groups are less likely recover quickly, but instead experience more stable symptoms of mental illness, and are more likely to relapse into mental illness after recovery.

The fact that many of the indicators of socio-economic disadvantage were associated with comorbidity after full adjustments suggests that multiple resources and exposures may be important in the generation and perpetuation of comorbidity inequalities, consistent with the FSC theory. These may include material deprivation, social deprivation, psychological factors, and knowledge. Particularly strong correlates of comorbidity were income and education suggesting that resources such as material deprivation, knowledge and health literacy may play an important role in comorbidity, and are generic for CMDS and PS.

These explanations outlined above are not mutually exclusive; indeed it is likely that all play a role in the observed comorbidity distributions to some extent. Thus, the socio-economic distribution of resources and exposures may drive the association between socio-economic disadvantage and comorbidity through low SES 1) acting as a generic risk factor for both mental and physical illness, 2)

interacting with pre-existing illness to amplify the risk of comorbidity, and 3) perpetuating comorbidity.

The role of explanatory variables in the adjusted models may point towards special importance of the third mechanism. Self-rated health was the most influential explanatory factor, and the variable which was most strongly associated with comorbidity, more so than any socio-demographic or socio-economic variables. While some have argued that self-rated health simply represents health [482], there are fundamental problems with the premises on which these arguments are based [483]. Rather than providing an objective clinical measure of health, self-rated health is more likely to be a construct that taps into a very subjective experience of health. Its close associations to functioning would further suggest that it captures the impact that health conditions place on the individual. It is also likely to reflect accumulation and chronicity of illness, which are core components of the third mechanism of comorbidity perpetuation.

If we accept self-rated health as an indication of the subjective burden of illness, the substantial attenuation of self-rated health on the associations between comorbidity and education and income would suggest that comorbidity places a greater burden on those with limited access to resources associated to household income and education.

The important resources which education represents are likely to include soft skills such as health literacy. These become developed and refined with increasing amounts of education, and enable better navigation of illness when it occurs [284]. Higher levels of education are also closely associated with perceptions of greater mastery and control over outcomes in life, including health outcomes [284]. Health literacy and control perception may be social and psychological factors which could play an important role in recovery of both mental and physical illness.

The resources associated with household income are likely to be related to education, as higher household income is an outcome of higher levels of education [284]. However, household income was the indicator most strongly associated to comorbidity, for both CMDS- and PS-physical comorbidity, which implies that there are additional important resources which are captured by household income. These may include material wealth, protection from actual

economic hardship as well as threat of economic hardship. A person who develops an illness in an already struggling household will plausibly experience a greater burden of this illness and perceive greater levels of threat from economic hardship, compared to a household where economic hardship is not an immediate threat already [284]. This increased level of threat itself might make recovery less likely, and if recovery is achieved, a continued existence in an economically struggling environment might make relapse more probable.

While self-rated health may have tapped into these mechanisms, it is unlikely to have captured the whole complexity through which these socio-economic mechanisms operate. This might explain why household income and education remained associated to comorbidity after adjustment to explanatory factors.

### 3.8.3 Why service use might be important

The same social and psychological resources described above may play an important role in generating or precipitating inequalities in comorbidity through various aspects of service use. Those from low SES groups may lack facilitating resources which may be necessary for accessing care and are thus more likely to experience barriers to care and, also receive poorer quality of care. Service use may be an example of how the second comorbidity mechanism may operate, as SES may interact with a pre-existing health condition to limit access to services. For example, those with physical illness and better access to resources may have greater chance at accessing care for mental health and/or receive better quality of mental health care. Conversely, those with mental illness and higher access to resources may not struggle as much as those with mental illness and few resources to access care for physical health needs and/or are more likely to receive better physical health care quality. SES may also be associated with greater difficulties to access healthcare at the area level, as those who live in more deprived areas often have worse access to high quality care [338]. Moreover, functional and social limitations are important determinants of service use, and are also characteristics of poor self-rated health. Given that self-rated health was the most influential explanatory factor in attenuating the socio-demographic and socio-economic associations, service use barriers brought about by functional limitations may play an important role in comorbidity.

In relation to the recovery and relapse discussion above, services may also provide an opportunity to buffer the likelihood of the perpetuation of comorbidity. Whilst it might be difficult for services to prevent the initial onset of comorbidity, services may be able to influence speed of recovery. Understanding the characteristics of socio-economic resources and what role these may play in accessing services and perpetuating comorbidity might thus have important clinical implications.

### 3.8.4 Strengths and limitations

This chapter provides a detailed description of those who experience mental-physical comorbidities at a local level. To my knowledge this is the first study to provide such detailed descriptions in a community sample whilst contrasting CMDS- and PS-physical comorbidity inequalities.

Some limitations are nevertheless worth noting. Whilst stressful life events were included as important explanatory factors, they were measured over the life course and may have been influenced by inherent recall biases of such measures. Whilst the mental health was measured using validated screens, the physical health measures were self-reported and may have been under-estimated. Whilst high agreement between self-reported and physician-diagnosed measures has been found for some conditions (e.g. coronary heart disease), the reliability and validity of self-report measures for other conditions (e.g. respiratory conditions) are poorer [484]. However, evidence suggests that self-reported measures of physical illness do not substantially bias estimates of mental-physical comorbidity [484]. The understanding of the causes of comorbidity is also limited by the cross-sectional nature of the datasets. While the results from the analysis are in support of the FSC theory, in terms of differential distribution of resources and exposures, it does not allow for distinguishing which of the 3 proposed explanations provided is the most dominant one. On the other hand, this chapter has provided a rich snap-shot perspective of the socio-demographic and socio-economic distribution of comorbidity, which has provided insight into the resources that are likely to be important in the generation and perpetuation of comorbidity.

### 3.8.5 Summary

This chapter has estimated the prevalence of comorbidity, described the social characteristics of those who experience mental-physical comorbidity and estimated socio-demographic and socio-economic associations after holding a number of known correlates constant. Results indicated that mental-physical comorbidity in South East London is common and characterised by distinct socio-economic inequalities, suggesting that resources associated to household income and education might play an important role in the aetiology of comorbidity. Mechanisms related to service use may be important as they are susceptible to SES in multiple ways. Service use mechanisms are also important to explore given that they are subject to possible policy intervention. However, in order to do so it is necessary to understand what aspects of service use are important. It is especially relevant to explore how mental health service uptake and quality is affected by comorbidity, given that these are under-researched in relation to comorbidity, compared to physical health services. The next chapter in this thesis will explore the association between comorbidity and mental health service use.

# Chapter 4 The association between mental-physical comorbidity and mental health service use

## 4.1 Chapter summary

This chapter addressed the second aim of the thesis: “to describe and explain the association between comorbidity and mental health service utilisation (MHSU) and quality”. It was hypothesised that those with mental-physical comorbidity would make greater and more persistent use of mental health services compared to those with non-comorbid mental illness. It was also hypothesised that perceived poor health and functioning would mediate the association between comorbidity and greater and more continuous service uptake.

While no differences between the comorbid and the non-comorbid groups were observed cross-sectionally, prospective analyses found an amplifying effect of mental-physical comorbidity on MHSU over time. Perceived functioning limitations due to emotional health was the most consistent mediator of the association between comorbidity and MHSU, but only partially accounted for the associations. Compared to non-comorbid MIS, comorbidity remained associated with greater secondary MHSU at follow-up, and with continuous MHSU over the timepoints, also after accounting for other explanatory factors.

The difference in persistence of MHSU between the comorbid and non-comorbid groups may be explained in three ways. First, certain factors may facilitate continuity of MHSU for the comorbidity group, such as regular service contact. Alternatively, the comorbidity group may have more complex psychiatric needs which take longer to resolve, therefore the persistence of MHSU. Finally, differences in gains from services may explain the differences between the groups over time. Compared to the non-comorbid group, the comorbidity group might be less likely resolve their mental health problems in services. This may either be due to inequities in quality of care, or due to a lack of social and psychological resources compromising the capacity to benefit from treatments.

## 4.2 Introduction

### 4.2.1 Rationale

Limited research explores the impact of comorbidity on mental health service use (MHSU), or examines mental health care quality by comorbidity status. In contrast, a large body of research has examined the impact of comorbidity on general healthcare use and specific physical health services. This research consistently indicates that those with mental-physical comorbidities make greater use of services [19, 21]. Compared to those with chronic health conditions without comorbid mental illness, those reporting mental–physical comorbidity use more primary care services, secondary care services, receive worse quality of care, and also have worse outcomes from specific healthcare procedures [13]. There are theoretical reasons to anticipate that comorbidity might be associated with increased MHSU as well as decreased MHSU.

On the one hand, those with mental-physical comorbidity tend to have poorer perceptions of health and functioning compared to those with non-comorbid illnesses [76, 77, 82, 485]. These are important determinants MHSU [365, 371, 374, 375, 377, 378], in part because of their close associations with perceived need for services [364, 486, 487]. Poorer perceived health and functioning among those with comorbidities may thus lead to increased likelihood of help-seeking on behalf of individuals, and in turn greater MHSU. More regular contact with health services among those with comorbid health conditions may also facilitate uptake of MHSU due to increased probability of detection on behalf of service providers, or disclosure on behalf of the service user as a result of increased trust towards the provider [421, 488].

On the other hand, physical comorbidity may mask symptoms of mental illness. Failure to identify mental illness symptoms on behalf of individuals may deter help-seeking. In contrast, failures to identify symptoms on behalf of the service providers (“diagnostic overshadowing”) may present barriers to effective treatments [158]. However, recent evidence suggests that physical illness facilitates detection of mental illness by physicians rather than the contrary [489].

Relatively few studies have explored the association between comorbidity and MHSU, and the limited empirical evidence contains conflicting findings. Some

studies either explicitly examine the impact of physical comorbidity on MHSU or include physical illness as a correlate. These tend to find that comorbidity is associated with greater MHSU, particularly secondary services [363, 397, 412, 413, 421, 426, 427, 434]. In addition, the likelihood of service use among those with clinical need is greater as the number chronic physical conditions accumulate [490]. This suggests that both need and subsequent service use may be greater among those with comorbidities. In contrast to these findings, others studies have observed no association between physical illness and greater MHSU either cross-sectionally [389, 491], or over time [370]. Others yet have found that comorbidity is associated with less MHSU [432].

Some of these discrepancies may be explained by inconsistent inclusion of variables capturing the burden of comorbidity, as a number of studies suggest that variables indicative of illness burden may contribute to greater MHSU. For example, perceived need for mental health services as well as actual MHSU has been found to increase with the accumulation of chronic physical conditions [427, 490]. Another study found that associations between asthma and secondary MHSU among depressed patients were fully attenuated after accounting for other comorbid chronic physical conditions [420]. Furthermore, comorbid depression and physical illnesses have been found to be associated with increased MHSU in the context of additional psychiatric conditions (e.g. anxiety) [425]. This suggests that amplified MHSU may be driven by the perceived burden of comorbidity which typically are found to be poor among those with comorbidity [39, 92, 492]. It is thus plausible that perceived health and functioning may mediate associations between comorbidity and greater MHSU. While perceived functional impairments have previously been found to mediate the associations between mental illness and MHSU [414, 493], these types of analyses has never been tested with respect to mental-physical comorbidity. The fact that no studies to date have explicitly examined the impact of comorbidity prospectively constitutes a further limitation of the literature. This could potentially be an important aspect to consider given the persistence of chronic mental and physical conditions.

Beyond service utilisation, an additional limitation concerns the limited understanding of how comorbidity impacts on the quality of mental health services received. While some evidence suggests that quality of mental health

care may be worse for persons with mental-physical comorbidity [89, 422], evidence is limited and inconclusive. Since Chapter 3 indicated that mental-physical comorbidity in SELCoH were associated with lower SES, those with comorbidities may be more likely to live in more deprived areas where access to good quality care may be more difficult [338]. As such, greater uptake of mental health services by those with mental-physical comorbidity may not necessarily constitute better or even equal care. Therefore quality of MHSU is relevant for a comprehensive understanding of MHSU.

The socio-demographic and socio-economic characteristics of those reporting comorbidities illustrated in Chapter 3, may also impact on MHSU by influencing help-seeking behaviour or access. They may also indirectly affect mental health service uptake, given that these statuses are intricately related to other important determinants of MHSU including perceived health and functioning, as well as social and attitudinal factors [389, 397, 426, 494, 495]. However, the socio-demographic, socio-economic, social and attitudinal factors show inconsistent associations with MHSU across studies. This suggests that the determinants of MHSU are specific to different healthcare contexts and populations. For example, MHSU has been observed to be lower among groups of low SES in a cross-national European study of general population samples (excluding the UK) [362] and in a Canadian community sample [362, 496]. In contrast, studies from the UK [363] and the Netherlands [366] have reported greater use of services by socio-economically deprived groups. The conflicting findings may be explained by inconsistent application of variables to adjust for “need” (e.g. psychiatric diagnosis vs. symptoms) and “need-related” factors (e.g. objective or subjective functioning measures), and variations healthcare system characteristics determining the ease of access to mental health services for low SES groups. Given that the inconsistency of these findings may be driven by contextual variations in healthcare systems for example, it is important to comprehensively examine how these explanatory factors relate to MHSU at a local level.

In summary, the research on comorbidity and MHSU is limited in a number of ways. First, most studies examining the impact of physical illness have not made explicit comparisons to a non-comorbid mental illness group. Therefore they provide no insight into the factors underlying the association between

comorbidity and MHSU. Second, no research to date has tested the potentially mediating role of perceived health and functioning in the comorbidity and MHSU association. Third, most research is cross-sectional and no research to date has explicitly tested the longitudinal impact of comorbidity on MHSU. Finally, limited research examines mental health care quality by physical comorbidity. I address these limitations in this chapter by exploring the relationship between comorbidity and MHSU, testing associations cross-sectionally, longitudinally and over time, as well as separately examining quality of primary care mental health services. The theoretical model of comorbidity and MHSU, incorporating potential mediating and explanatory factors, is illustrated in Figure 20.

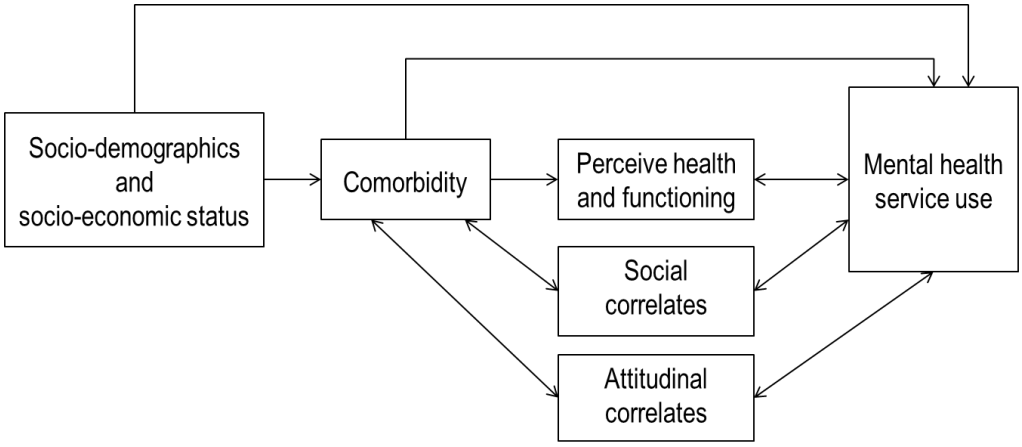



Figure 20 Theoretical model of comorbidity and mental health service use

### 4.2.2 Aims and hypotheses

#### 4.2.2.1 Aims

This chapter addresses Aim 2 of the thesis: “to describe and explain the association between comorbidity and mental health service utilisation and quality”. Five specific aims were formulated. Figure 21a-d illustrate the associations tested in the specific aims A2.2-2.5.

A2.1 To estimate the prevalence of MHSU.

A2.2 To test associations between comorbidity, and MHSU and quality outcomes.

A2.3 To test associations between comorbidity, and perceived health and functioning.

A2.4 To test associations between perceived health and functioning, and MHSU outcomes.

A2.5 To test the mediating effect of perceived health and functioning in the associations between comorbidity and MHSU outcomes.

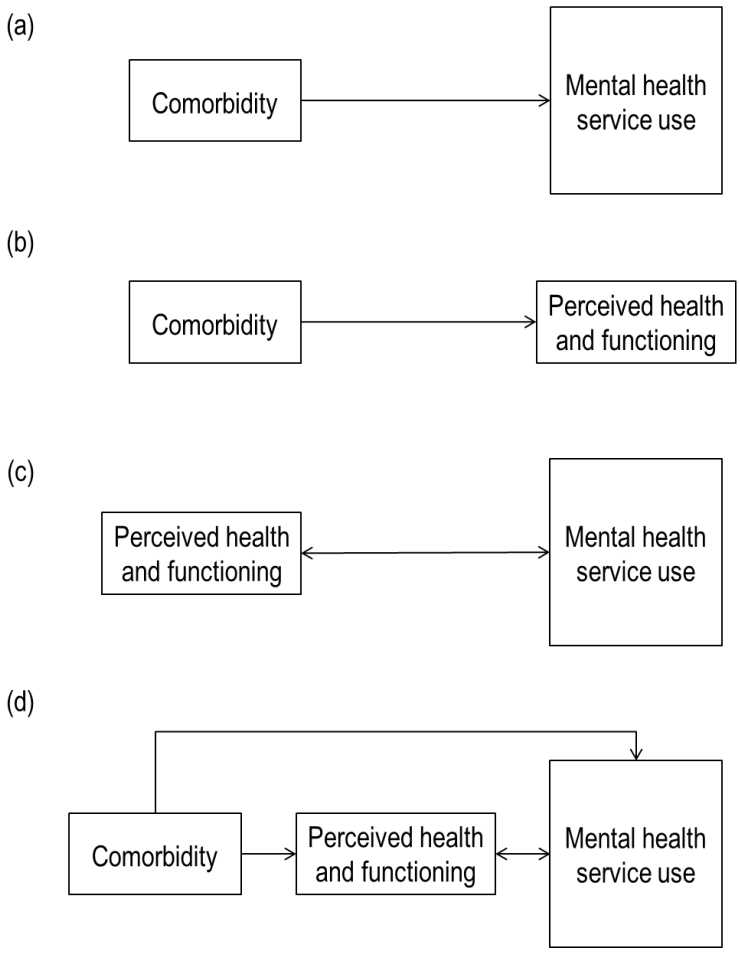



Figure 21 (a) Tests of associations between comorbidity and MHSU outcomes (A2.2); (b) Tests of associations between comorbidity and perceived health and functioning (A2.3); (c) Tests of associations between perceived health and functioning and MHSU outcomes (A2.4); (d) Test of the mediating effect of perceived health and functioning in the associations between comorbidity and MHSU (A2.5)

#### 4.2.2.2 Hypotheses

Based on the literature reviewed in Chapter 1, the following hypotheses were derived. Numbers in brackets indicate the specific aim that is being addressed.

H1) Compared to those reporting no MIS and non-comorbid MIS, those reporting comorbidity at S1 are more likely to report uptake of mental health services, such that:

a. there is a cross-sectional association between comorbidity at S1 and primary and secondary MHSU at S1.

b. there is a prospective association between comorbidity at S1 and primary and secondary MHSU at S2.

c. there is an association between comorbidity at S1 and more continuous MHSU over time. (Aim 2.2)

H2) Compared to those reporting no MIS and non-comorbid MIS, associations between comorbidity and secondary MHSU are stronger relative to associations between comorbidity and primary MHSU (Aim 2.2).

H3) Compared to those reporting no MIS and non-comorbid MIS, associations between comorbidity and continuous MHSU are stronger relative to associations between comorbidity and either discontinued or initiated MHSU (Aim 2.2).

H4) Compared to those reporting no MIS and non-comorbid MIS, those reporting comorbidity are registered with GP practices performing more poorly on quality indicators of mental health care (Aim 2.2).

H5) Compared to those reporting no MIS and non-comorbid MIS, those reporting comorbidity report poorer perceived health and functioning (Aim 2.3).

H6) Relative to no MHSU, there is greater cross-sectional and prospective primary and secondary MHSU, and greater continuous MHSU over time among those reporting poorer perceived health and functioning (Aim 2.4).

H7) Indicators of poor perceived health and functioning mediate the cross-sectional and prospective associations between comorbidity and MHSU, and the association between comorbidity and continuous MHSU, such that associations are fully attenuated when these variables are incorporated into the model (Aim 2.5).

H8) After adjusting for other potential mediators and explanatory factors, perceived functioning limitations due to emotional health remains associated with greater cross-sectional and prospective primary and secondary MHSU, and greater continuity of MHSU (Aim 2.5).

## 4.3 Methods

### 4.3.1 Measures

Data from the SELCoH surveys and the Quality Outcomes Frameworks were used to address the specific aims of this chapter. The measures used from these data sources are outlined below. Variables from SELCoH were informed by measures from both the first and second study wave. The headings of each section outlining a SELCoH variable are followed either by “S1”, “S2” or “S1+S2” in parentheses. “S1” and “S2” indicates that the variable was measured at the S1 or S2 timepoint, respectively, while “S1+S2” indicates that the variable was derived using measures from both timepoints.

#### 4.3.1.1 Service utilisation and quality outcomes

The outcome measures are outlined briefly in the sections below; a detailed description of the measurement and construction of the variables can be found in section 2.4.

##### 4.3.1.1.1 Mental health service use (MHSU) (S1+S2)

Three MHSU variables were used as utilisation outcomes (Figure 22). These included 2 12-month MHSU variables which distinguished between primary care use (only) and secondary care use (with or without primary care use); one measured in S1 and the other in S2. The third MHSU variable was a derived variable of MHSU patterns between S1 and S2.

The 12-month MHSU variables were obtained from questions asking about service use for mental health in the past year. Among those reporting MHSU, follow up questions asked which sectors respondents had received mental health care from, coding all that applied. Service users were grouped into *“*primary MHSU only*”* (those only selecting the GP category), and “secondary MHSU”. The secondary MHSU group included those who reported use of services from psychological therapist/counsellor or from a mental health specialist, regardless of whether primary care services had also been used or not, generating the derived 3-category variable. Among all those who endorsed MHSU, satisfaction with care was recorded. Reasons for dissatisfaction were also measured among those who reported dissatisfaction with their mental health consultation.

The MHSU patterns variable was derived by cross-tabulating the S1 and S2 MHSU variables, generating 4 mutually exclusive groups: no MHSU, discontinued MHSU at S2, initiated MHSU at S2 and continuous MHSU. These categories considered any MHSU, making no distinction between primary or secondary care sectors.

**Mental health service use (MHSU)**

**12-month mental health service use (S1) (N=1698)**
- No MHSU
- Primary MHSU only
- Secondary MHSU

**12-month mental health service use (S2) (N=1052)**
- No MHSU
- Primary MHSU only
- Secondary MHSU

**Mental health service use patterns (S1+S2) (N=1052)**
- No MHSU (no use S1, no use S2)
- Discontinued MHSU (use S1, no use S2)
- Initiated MHSU at S2 (no use S1, use S2)
- Continuous MHSU (use S1, use S2)

**Service use satisfaction variables (S1, S2)**

*Among those reporting any MHSU:*
**Satisfaction with services *(S1, S2)***
- Satisfied
- Dissatisfied
- *Among those reporting dissatisfaction:*
  - ***Reasons for dissatisfaction (S1, S2)***
  - Doctor did not listen or ignored me
  - Treatment was inappropriate
  - Not given tests, treatment or hospitalisation which seemed important
  - Doctor said there was nothing wrong or nothing they could do
  - Could not communicate properly with the doctor
  - Doctor did not understand me
  - Other

Figure 22 Mental health service use measures used in Chapter 4

#### 4.3.1.1.2 Quality of mental health services in primary care (S1)

The derived national tertiles of Quality Outcome Framework (QOF) scores were used to indicate primary mental health care quality in S1. Low, moderate and high categories of separate quality indicators were used (Figure 23). The

category boundaries for each indicator were based on tertiles derived from the distribution of national QOF achievement (see 2.4.3.5).

The national tertiles of the QOF achievement (total score) and overall clinical achievement (proportion of achievement on all clinical targets) were used in order to indicate how mental health quality stood in relation to overall primary care quality. The achievements of the mental health (referring to SMIs) and depression domains were combined into a general measure of mental health service quality. The mental health and depression domains were also examined separately. Finally, the achievement of a specific depression target relating to comorbidity was examined separately. This indicator measured depression screening among patients with a range of chronic physical conditions.

**Quality of primary care mental health services**

**Overall QOF achievement**
- Low
- Moderate
- High

**Overall clinical achievement**
- Low
- Moderate
- High

**Combined achievement on mental health and depression indicators**
- Low
- Moderate
- High

**Mental health achievement**
- Low
- Moderate
- High

**Depression achievement**
- Low
- Moderate
- High

**Achievement on indicator of depression screening in chronic physical conditions**
- Low
- Moderate
- High

Figure 23 Measures of primary care mental health service quality used in Chapter 4

#### 4.3.1.2 Independent variables

Comorbidity (measured in S1) was the main independent variable of interest. Other independent variables included indicators of perceived health and functioning which were conceptualised as potential mediators (measured in S1). Explanatory factors included socio-demographic, socio-economic, social and attitudinal indicators (measured in S1 and/or S2).

##### 4.3.1.2.1 Comorbidity (S1)

Given that the aims of this chapter concerned utilisation and quality of mental health services, the most relevant comparison with regards to comorbidity concerned the non-comorbid MIS and MIS-physical comorbidity groups. The non-comorbid physical illness category was therefore collapsed with the no identified illness category, creating a 3-categorical comorbidity variable: no MIS, non-comorbid MIS, and MIS-physical comorbidity (Table 24).

Table 24 The thee-categorical MIS-physical comorbidity variable

| **Physical illness** | **Mental illness symptoms (MIS)** | | |
|---|---|---|---|
| | No | Yes | *Total n* |
| No | 797 | 247 | 1044 |
| Yes | 395 | 242 | 637 |
| *Total n* | 1192 | 489 | 1681 |

No MIS
Non-comorbid MIS
MIS-physical comorbidity

The broad MIS variable was the only mental illness variable examined with respect to comorbidity in this chapter. Sample size did not permit separate examination of CMDS and PS comorbidity variables. Specifically, the PS-comorbidity category only contained n=82 observations, suggesting that cell counts would be too small for multivariate regression analyses when distributed across the 3 and 4 categories of the MHSU outcomes.

#### 4.3.1.2.2 Health-related indicators (S1, S2)

The indicators of perceived health and functioning used for mediation included somatic symptom severity, self-rated health, perceived functioning limitations due to emotional health and daily functioning problems. These were measures from the S1 dataset. From S2, a measure of MIS was used as an explanatory variable. The categorisations of these variables are shown in Figure 24. The perceived health and functioning indicators were selected based on theoretical grounds and empirical evidence indicating that perceptions of poorer symptom severity [45, 497, 498], general health [499, 500] and functioning [12, 492] are important outcomes of comorbidity. Given that these health and functioning constructs are also indicators of greater clinical or perceived need for mental health services, they are also important determinants of service use [362–366, 371, 374, 375, 378]. Thus, as perceived health and functioning are, theoretically, on the causal pathway between comorbidity and service utilisation, perceived health and functioning indicators were conceptualised as mediators.

Statistical tests of mediation demands that the variables follow a temporal order, such that the mediators occur prior to the outcome. Given that MHSU was measured over the past year, and indicators of perceived health and functioning were measured over past 2 weeks or the past month, both in S1 and S2, S2 measures of health and functioning were not used as these would have captured perceived health and functioning after the event of MHSU.

Somatic severity was indicated by the total scores from Patient Health Questionnaire 15 somatic symptom severity scale (PHQ-15), categorising the total score into low, moderate and high somatic severity. A binary recoding of the five-point measure of self-rated health from the 12-item Short-Form Health Survey (SF-12) into fair/poor vs. good/very good/excellent was used. The item asking about perceived functional limitations to due emotional health from the SF-12 provided a subjective measure of functioning, directly related to mental health. Daily functioning problems were measured with a binary variable obtained by grouping those reporting problems with managing 2 or more of 5 activities in daily life (personal care, personal care, getting out and about, medical care, household activities and managing money) and those reporting problems with 1 activity or no problems.

Mental illness symptoms (MIS), measured at follow-up, was used as an explanatory variable in analyses testing for mediation with the MHSU S2 and the MHSU patterns outcomes (aim 2.5). MIS at S2 were informed by above threshold scores on the CIS-R (indicative of CMD symptoms) and any self-reported longstanding mental illness.

Detailed descriptions of the health-related variables are outlined in section 2.7.

**Potential mediators: perceived health and functioning**

**Somatic symptom severity (S1)**
- Low
- Moderate
- High

**Self-rated health (S1)**
- Good/Very good/excellent
- Fair/poor

**Perceived functioning limitations due to emotional health (S1)**
- No
- Yes

**Daily functioning problems (S1)**
- 0-1
- ≥2

**Explanatory factor**

**Mental illness symptoms (MIS) (S2)**
- No
- Yes

Figure 24 Health-related measures used in Chapter 4

#### 4.3.1.2.3 Socio-demographics (S1)

Socio-demographic factors included gender, age, relationship status, ethnicity and migrant status, and were all measured at S1. In unadjusted analyses, all socio-demographic variables used the same categorisations as in Chapter 3 (Figure 25). In multivariate analyses, age was used as a continuous measure and ethnicity was collapsed into a binary variable contrasting those of White etnicity against Non-White (Black Caribbean, Black African, Other) ethnicity in order to improve model stability.

**Socio-demographic indicators**

**Gender (S1)**
- Male
- Female

**Age (S1)**
- 16-29
- 30-39
- 40-49
- 50-59
- 60 or over

**Relationship status (S1)**
- Married/cohabitating
- Single
- Previously in relationship

**Ethnicity (S1)**
- White
- Black Caribbean
- Black African
- Other

**Migrant (S1)**
- UK born
- <10 years in the UK
- ≥10 years in the UK

Figure 25 Socio-demographic measures used in Chapter 4

#### 4.3.1.2.4 Socio-economic status (S1+S2)

Socio-economic variables from S1 and S2 were used, applying different sets of socio-economic variables according to the MHSU outcome used (Figure 22). For the MHSU (S1) outcome, SES variables from S1 were used (Figure 26). These included the S1 measures of education, employment, household income, debt and benefits receipt. The categorisations of these variables were the same as those previously used in Chapter 3. The SES variables tested with the MHSU (S2) and the MHSU patterns (S1+S2) outcomes included the S1+S2 measures of education, adverse employment conditions, low household income, chronic debt, and benefits receipt.

Education (S1+S2) measured the highest level of educational attainment reported in the S1 and S2 surveys. The adverse employment conditions (S1+S2) variable was generated by cross-tabulating employment at S1 and S2. Transitions out of employment/education at S1, into unemployment, permanent sickness/disability, carer roles, or early retirement (age <65) at S2 were considered adverse employment conditions. Persistent non-participation in work or education at S1 and S2 (unemployment, permanent sickness/disability, carer

roles, or early retirement) were also considered adverse employment conditions. Household income at S1 and S2 were combined to produce a single binary variable of low household income. Those who reported persistently low household income by selecting either of the 2 lowest annual income categories (£0-5,475 and £5,476-12,097) at both S1 and S2 were included in the low household income category. Those who also reported a sharp decline in household income were also considered having low household income. Chronic debt contrasted those who reported debt at S1 and S2 against all others (no debt at any timepoint, and debt at S1 or S2 only). The benefits receipt variable (S1+S2) considered those who reported receipt of benefits at any timepoint, and contrasted this group against those never reported any benefits receipt.

For detailed descriptions of the SES variables, see section 2.6.

**Socio-economic indicators (S1)**

**Education (S1)**
- No qualifications
- GCSE
- A-level
- Degree

**Employment status (S1)**
- Working
- Not working
- Students

**Annual household income (S1)**
- £0-5,475
- £5,476-12,097
- £12,098-20,753
- £20,754-31,494
- £31,495 or more

**Debt (S1)**
- No
- Yes

**Benefits (S1)**
- No
- Yes

**Socio-economic indicators (S1+S2)**

**Education (S1+S2)**
- No qualifications
- GCSE
- A-level
- Degree

**Adverse employment conditions (S1+S2)**
- No
- Yes

**Low household income (S1+S2)**
- No
- Yes

**Chronic debt (S1+S2)**
- No
- Yes

**Benefits (S1+S2)**
- No
- Yes

Figure 26 Socio-economic measures used in Chapter 4

#### 4.3.1.2.5 Social indicators (S1, S1+S2)

The social variables included social support, social network size and stressful life events (Figure 27). Social support and social network size were only measured in S1, while stressful life events were measured at both timepoints. Low social support comprised those reporting either instrumental or emotional

support but not the other, and those who reported neither form of support, while high emotional support included those who reported the availability of both emotional and instrumental support. The social network size variable captured the number of weekly contacts a person had had with different groups of people (e.g. friends, family). The measures of stressful life events counted the number of different types of stressful experiences reported in lifetime, and were made categorical. See section 2.8 for detailed descriptions of the measures.

**Social indicators**

**Social support (S1)**
- Low
- High

**Social network size (no. weekly contacts) (S1)**
- 2 or less weekly contacts
- 3-4 weekly contacts
- 5 or more weekly contacts

**Stressful life events (S1)**
- 0-2
- 3-5
- 6 or more

**Stressful life events (S1+S2)**
- 0-2
- 3-5
- 6 or more

Figure 27 Social measures used in Chapter 4

#### 4.3.1.2.6 Attitudinal indicators (S2)

The attitudinal indicators included 3 questions about attitudes towards help-seeking and 1 question about the perceptions regarding the effectiveness of mental health treatments (Figure 28). Four response options were collapsed such that they became binary variables. The effectiveness perception measure asked respondents to indicate the percentage of people they believed benefit from professional treatment for emotional problems on a scale from 1-100. Responses were grouped into categories of low (<50%), moderate (50-74%), and high (75-100%) perceived effectiveness of treatment.

**Attitudinal indicators (S2)**
**Would seek help for serious emotional problem (S2)**
Definitely/probably
Definitely not/probably not
**Would feel comfortable talking about personal problems with professional (S2)**
Definitely/probably
Definitely not/probably not
**Would feel embarrassed if friends knew about help-seeking for emotional problem (S2)**
Definitely not/probably not
Definitely/probably
**Effectiveness perceptions of mental health treatment (S2)**
Low
Moderate
High

Figure 28 Attitudinal measures used in Chapter 4

### 4.3.2 Analysis

The analytical methods used to address the aims of this chapter are described separately for each of the five specific aims, below. As in Chapter 3, estimates were calculated with 95% confidence intervals, and exact p-values from statistical tests are presented. All analyses were estimated with robust standard errors making adjustments for the clustered survey design and non-response at the household level using the *svy* command in Stata [469]. The appropriate weights were applied for analyses using the S1 and S2 samples. In multinomial regression models, post-hoc comparisons between outcome categories which were not specified as the reference were performed using the *listcoef* command. Post-hoc comparisons within categorical variables (e.g. non-comorbid MIS vs. MIS-physical comorbidity) were performed by re-running models whilst temporarily changing the reference of the categorical variables, separately for different variables.

#### 4.3.2.1 Aim 2.1: Prevalence of mental health service use

In addressing the first aim, prevalence estimates of service utilisation outcomes were calculated separately for the S1 and S2 samples. Prevalence estimates of overall satisfaction with MHSU were also estimated among those who reported service use in the respective datasets.

#### 4.3.2.2 Aim 2.2: Unadjusted comorbidity and mental health service use associations

The analyses testing associations between comorbidity and the MHSU and quality outcomes made use of cross-tabulations and multinomial regression methods. Distribution differences in service outcomes by comorbidity were tested using Chi-square tests with Rao & Scott corrections, while regression methods tested the strength of specific associations. The following sections detail the analytic strategies for each of the outcomes.

##### 4.3.2.2.1 Primary and secondary mental health service utilisation (S1 and S2)

Analyses testing the associations between comorbidity and primary and secondary MHSU were tested both cross-sectionally using the S1 outcome variable, and longitudinally using the S2 outcome variable. The category of 'no MHSU' represented the reference category in the multinomial models. The estimated relative risk ratios (RRRs) thus indicated the risk of placement in either the primary or secondary MHSU categories, relative to no MHSU.

##### 4.3.2.2.2 Mental health service use patterns (S1+S2)

Longitudinal analyses using the MHSU patterns outcome were tested using the S2 sample. Multinomial regression models used the category of 'no MHSU' as the reference category. Thus, the RRR's estimated the risk of reporting discontinued, S2 initiated and continuous MHSU, relative to the reference of no MHSU.

##### 4.3.2.2.3 Quality of primary care mental health services (S1)

Analyses examining the association between comorbidity and mental health service quality were carried out cross-sectionally, using a subsample of S1 respondents who consented to providing their GP details and were registered with a practice in Lambeth or Southwark. Out of the subsample consisting of 1197 individuals (70.6% of the S1 sample, 80.3% of consenting S1 respondents), 637 were registered with 1 of the 50 practices in Lambeth, and 561 persons were registered with 1 of 50 practices in Southwark. The exact numbers of respondents located in individual surgeries is shown in Table B1 Appendix B. Cross-tabulations and regression analyses tested the associations between comorbidity with each of the 6 primary care quality variables. The low

quality tertile category of each quality variable represented the reference in the multinomial regression.

#### 4.3.2.3 Aim 2.3 and 2.4: Associations with potential mediators

The tests for mediation followed the steps outlined by Baron and Kenny [501], where the first three steps involve establishing associations between: 1) the exposure (comorbidity) and the outcomes (MHSU) (tested in aim 2.2); 2) the exposure (comorbidity) and the mediators (perceived health and functioning) (tested in aim 2.3), and 3) the mediators (perceived health and functioning) and the outcomes (MHSU) (tested in 2.4). In order to complete steps 2 and 3, analyses addressing Aim 2.3 estimated the association between comorbidity and potential mediators, while analyses addressing Aim 2.4 tested the association between potential mediators and MHSU outcomes.

##### 4.3.2.3.1 Aim 2.3: Associations between comorbidity and potential mediators

The analyses testing the associations between comorbidity and the potential mediators (perceived health and functioning) were carried out in both the cross-sectional S1 sample and the S2 sample, using comorbidity as an independent variable, measured in S1. Cross-tabulations and logistic and multinomial regression methods tested the associations. Multinomial regression was applied to the measure of somatic symptom severity which had three categories, using “low somatic symptom severity” as the reference category. Thus the RRR’s represented the risk of placement in moderate and high somatic severity groups, relative to this reference.

##### 4.3.2.3.2 Aim 2.4: Associations between potential mediators and service outcomes

Aim 2.4 sought to test the associations between potential mediators with MHSU outcomes. In line with Baron and Kenny’s mediation steps, these analyses were informed by the previous analyses in this chapter in 2 ways. First, analyses only tested MHSU outcomes where an association with non-comorbid MIS or MIS-physical comorbidity had been observed (aim 2.2). Second, only the potential mediators for which and association with non-comorbid MIS or comorbidity had

been established were eligible for inclusion in these analyses (aim 2.3). Potential mediators tested with the MHSU (S1) outcome required an established association with non-comorbid MIS or comorbidity in the in the cross-sectional S1 sample (aim 2.3). Potential mediators tested with the MHSU (S2) and MHSU patterns (S1+S2) outcomes required an association with non-comorbid MIS or comorbidity in the in the S2 sample (aim 2.3). An association was considered statistically significant at a conventional p-value level of 0.05.

As with analyses addressing aim 2.2, cross-tabulations and unadjusted multinomial regression models were used to test associations between potential mediators with each of the MHSU outcomes. The same reference categories were used as those outlined in section 4.2.2.2.

#### 4.3.2.4 Aim 2.5 Mediation of health and functioning in the comorbidity and service use associations

##### 4.3.2.4.1 Testing for mediation of health and functioning indicators

Consistent with the steps of mediation, the analyses addressing aim 2.5 were informed by the outcomes from analyses of aims 2.3, 2.3 and 2.4. Three-variable multinomial regression models tested associations between comorbidity and service outcomes which had met the first mediation criterion, separately including potential mediators which had met the second and third mediation criteria. A variable was considered having a mediating effect where 1) there was substantial attenuation in the association between comorbidity and the outcome, and 2) the mediator was significantly associated with the outcome [501]. A “substantial” attenuation was operationalised as a 10% change in an unadjusted unexponentiated coefficient [502], and conventional p-values of 0.05 were considered statistically significant.

Given that indicators of perceived health and functioning may be closely associated to one another, any observed mediating effect could potentially have been confounded by association with another mediator. Therefore, the health and functioning variables for which there was evidence of mediation were included in multivariate regression models, adjusting for other mediating variables. The variables which were significantly associated ($p<0.05$) with the

MHSU outcomes in these models were carried forward to the fully adjusted model, incorporating explanatory factors.

#### 4.3.2.4.2 Selection of explanatory factors

Socio-demographic, socio-economic, social and attitudinal factors, and MIS at follow-up were conceptualised as explanatory factors. Socio-demographic indicators, social support and social network size from S1 were tested with all MHSU outcomes. For the MHSU (S1) outcome socio-economic indicators and stressful life events from S1 were used, whereas the respective S1+S2 variables were tested with the outcomes of MHSU (S2) and MHSU patterns. Attitudinal factors and MIS at S2 were only tested with the MHSU (S2) and MHSU patterns outcomes.

Whilst there are theoretical grounds for including all of these explanatory factors in the fully adjusted models, sample size restrictions did not permit inclusion of all variables whilst maintaining a statistically stable model. Therefore, a 4-step process of variable reduction was performed, which was guided both by theoretical and statistical principles. These were:

1) establishing an association between comorbidity and explanatory factors
2) establishing an association between explanatory factors and MHSU outcomes
3) establishing whether explanatory factors influence the association between comorbidity and MHSU outcomes and/or are independently associated with MHSU outcomes in models including comorbidity
4) establishing whether associations between explanatory factors and MHSU outcomes are associated in model adjusting for similar explanatory variables

These steps were repeated for all MHSU outcomes.

##### 4.3.2.4.2.1 Step 1: Associations between comorbidity and explanatory factors

Cross-tabulations and logistic and multinomial regression analyses tested associations between comorbidity and explanatory factors. The socio-demographic and socio-economic indicators were conceptualised as antecedent variables to comorbidity, while the remaining factors were conceptualised as intervening variables between comorbidity and MHSU (illustrated in Figure 20). Socio-demographic and socio-economic indicators

were therefore tested in multinomial regression models with comorbidity as the outcome, using “no identified MIS” as the reference category. Thus, the RRR’s estimated the relative risk of placement in “non-comorbid MIS” and “MIS-physical comorbidity”, relative to this reference. Social and attitudinal variables were tested in logistic and multinomial regression models as outcomes with comorbidity as the independent variable. Logistic regression analyses were used for the binary variables (social support and attitudes toward help-seeking). Multinomial regression was used for the 3-categorical variables (social network size, stressful life events and effectiveness perceptions) using 0-2 contacts, 0-2 events and “low perceived effectiveness” as a reference categories, respectively.

Whilst associations between socio-demographic and socio-economic indicators and MIS-physical comorbidity were extensively explored in Chapter 3, the unadjusted associations between socio-demographic and socio-economic factors and comorbidity were repeated in this chapter for two reasons. First, the analyses in Chapter 3 made use of a comorbidity variable containing 4-categories, whereas the analyses in this chapter collapsed those reporting non-comorbid physical illness with those reporting neither mental nor physical illness. Thus, the reference group for the comorbidity variable in these analyses was different. Secondly, the analyses in the previous chapter only estimated associations between socio-demographic and socio-economic indicators in the full S1 sample, whereas the analyses in this chapter also made use of the S2 sample. Although loss-to-follow-up was not systematic, an explicit understanding of how socio-demographic and socio-economic factors were associated with comorbidity in the S2 sample was nevertheless necessary. A different set of SES indicators considering changes in SES between S1 and S2 were also used in this chapter, which had previously not been tested with comorbidity

These analyses were repeated for the S1 and S2 sample.

#### 4.3.2.4.2.2 Step 2: Associations between explanatory factors and MHSU outcomes

Cross-tabulations and multinomial regression analyses tested associations between explanatory factors and MHSU outcomes. Step 2 only tested

explanatory variables which were associated with comorbidity (step 1, $p<0.05$). Multinomial models used the same reference categories for the MHSU outcomes as outlined in 4.2.2.2.

#### 4.3.2.4.2.3 Step 3: Influence of explanatory factors on the association between comorbidity and MHSU outcomes

Three-variable multinomial regression models including comorbidity, the MHSU outcome and an explanatory variable were tested in step 3. Explanatory factors eligible for testing in this step were those which demonstrated an unadjusted association with comorbidity (step 1) and the relevant MHSU outcome (step 2). Variables were carried forward for block-adjustment (step 4) if they either 1) substantially affected the association between comorbidity and MHSU, or 2) were significantly associated with the outcome variable in the three-variable models including comorbidity. A 10% change in the unadjusted and unexponentiated coefficient was considered a “substantial change” in the association between non-comorbid MIS and comorbidity and the service outcomes. The 10% threshold has been advised in confounder selection guidelines [502], and was more stringent than 5% thresholds used previously published work in order to inform the reduction of a large number of correlates [140]. More liberal criteria of significance were applied ($p>0.10$) in order to select explanatory factors, as previous research has demonstrated that conventional p-values of 0.05 may omit potentially important variables [503, 504].

#### 4.3.2.4.2.4 Step 4: Independent associations between explanatory factors and MHSU outcome whilst controlling for similar explanatory factors

The block-adjusted models separately tested blocks of socio-demographic, socio-economic, social and attitudinal variables, whilst incorporating comorbidity. Only variables statistically associated with the service outcomes in the block-adjusted models (according to liberal p-values of 0.010) were carried forward to the fully-adjusted model. Given that MIS at S2 was the only health-related confounder, it could not be incorporated in a block-adjusted model. Therefore its inclusion in the fully-adjusted models was determined based on the outcome of step 3.

Ethnicity and migrant status were tested in the block-adjusted socio-demographic model regardless of outcomes of the analyses in step 1, 2 or 3. This was due to the fact that ethnicity and migrant status may only emerge as an important vulnerability factor in the presence of the other status, in keeping with an intersectional theoretical approach [256]. A similar logic was applied to social variables. Given that psychosocial resources may only be relevant in the presence of social adversity, all social variables were tested in block-adjusted social models before dismissed.

##### 4.3.2.4.3 Adjusted models

Comorbidity and potential mediators were tested with the MHSU outcomes in fully-adjusted mediation models, including explanatory factors, in order to examine whether the association between the perceived health and functioning mediators remained statistically associated with the MHSU outcomes after accounting for explanatory factors. Age and gender were included in the fully-adjusted models regardless of the outcomes of the selection process, as these were considered too conceptually important to dismiss from the fully adjusted model.

## 4.4 Results of Aim 2.1: Prevalence estimation

### 4.4.1 Prevalence of mental health service use

The overall prevalence estimates of MHSU in S1 and S2 were comparable although slightly higher in S1: the prevalence of MHSU in S1 was 16.9% and 14.5% in S2 (Table 25).

Examined by the mutually exclusive categories distinguishing primary from secondary MHSU indicated that 8.8% of S1 respondents reported use of primary care sources only, while 8.0% reported use of secondary care sources (psychological therapist/counsellor or mental health specialist), with or without use of primary MHSU. Half of those in the secondary care category also reported primary MHSU (analyses not shown). Similarly, in S2 the prevalence of primary MHSU only was 7.4%, and secondary MHSU was 7.0%. Thirty-eight percent of those reporting MHSU of secondary care sources in S2 also reported use of primary care sources (analyses not shown).

“Primary care services” was the most common type of service used; 12.7% and 10.1% reported used of MHSU in primary care in S1 and S2, respectively (analyses not shown). “Psychological therapist” or “counsellors” were the most common type of secondary care services used, reported by 6.9% and 5.2% in S1 and S2, respectively. Approximately 2% reported use of specialist mental health services at both timepoints (analyses not shown).

Table 25 also shows the prevalence of dissatisfaction of care among those who reported use of primary and secondary care services. In S1, 14.5% of service users were dissatisfied with the care they received. The most frequently provided reason for dissatisfaction was “the doctor did not listen to me”, reported by 41.1% of those reporting dissatisfaction with services. The next most prevalent category of reason for dissatisfaction was “other” (reasons not specified).

The prevalence of dissatisfaction with services was lower among those reporting MHSU in S2, where 1 in 10 reporting dissatisfaction with services. The most common reasons for dissatisfaction were “treatment was inappropriate” and “doctor did not listen or ignored me”, reported by 45.9% and 40.9% of those reporting dissatisfaction, respectively. However, cell counts were very small and the results should thus be interpreted cautiously.

Table 25 Prevalence of 12-month mental health service use in S1 and S2

| | n % (95% confidence intervals) | | | | | |
|---|---|---|---|---|---|---|
| | **S1** | | | **S2** | | |
| ***Full sample*** | (N=1698) | | | (N=1052) | | |
| ***Mental health service use (past 12 months)*** | | | | | | |
| No MHSU | 1406 | 83.2 | (81.1-85.0) | 902 | 85.5 | (83.1-87.6) |
| Any MHSU | 278 | 16.9 | (15.0-18.9) | 150 | 14.5 | (12.4-16.9) |
| *Primary MHSU only* | 143 | 8.8 | (7.5-10.4) | 75 | 7.4 | (5.9-9.3) |
| *Secondary MHSU* | 135 | 8.0 | (6.7-9.5) | 75 | 7.0 | (5.6-8.8) |
| ***Satisfaction of care among service users*** | (n=278) | | | (n=150) | | |
| Satisfied with care | 228 | 85.5 | (80.9-89.1) | 135 | 89.4 | (82.9-93.7) |
| Dissatisfied with care | 43 | 14.5 | (10.9-19.1) | 15 | 10.6 | (6.3-17.1) |
| ***Reasons for dissatisfaction among those who reported dissatisfaction*** | (n=43) | | | (n=15) | | |
| Doctor did not listen or ignored me | 18 | 41.1 | (26.8-57.0) | 7 | 40.9 | (17.5-69.2) |
| Treatment was inappropriate | 12 | 27.7 | (15.9-43.6) | 7 | 45.9 | (20.4-73.6) |
| Not given tests, treatment or hospitalisation which seemed important | 9 | 20.4 | (10.6-35.7) | 5 | 27.5 | (9.8-57.0) |
| Doctor said there was nothing wrong or nothing they could do | 8 | 16.9 | (8.3-31.4) | 2 | 8.2 | (1.6-32.8) |
| Could not communicate properly with the doctor | 11 | 24.7 | (13.7-40.4) | 0 | - | - |
| Doctor did not understand me | 12 | 27.6 | (15.9-43.5) | 1 | 3.8 | (0.4-28.5) |
| Other | 15 | 34.5 | (21.3-50.5) | 2 | 17.4 | (3.6-54.2) |

### 4.4.2 Prevalence of mental health service use patterns

Table 24 shows the distribution of different MHSU patterns in the S2 sample. Approximately three quarters of respondents did not report MHSU either at S1 or S2. The service users were roughly evenly distributed across the remaining categories: 8.4% reported MHSU at both timepoints, 9.7% reported MHSU at S1 but discontinued use at S2, and 7.7% reported initiated MHSU at S2.

Table 26 Prevalence of continuity of service use: S2 sample (N=1052)

| | **n** | **% (95% confidence intervals)** |
|---|---|---|
| ***Continuity of mental health service use*** | | |
| No MHSU (no use S1, no use S2) | 786 | 74.2 (71.3-76.8) |
| Discontinued MHSU (use S1, no use S2) | 99 | 9.7 (8.0-11.8) |
| S2 initiated MHSU (no use S1, use S2) | 80 | 7.7 (6.2-9.5) |
| Continuous MHSU (use S1, use S2) | 87 | 8.4 (6.9-10.4) |

## 4.5 Results of Aim 2.2: Unadjusted associations between comorbidity and service use outcomes

### 4.5.1 Comorbidity and primary and secondary mental health service use

The prevalence distributions of primary and secondary MHSU by comorbidity in S1 and S2 are presented in Table 27. In S1, 21% of those reporting mental-physical comorbidity reported primary MHSU (only) and 18.5% reported secondary MHSU. The prevalence of MHSU at S1 was also higher among those reporting non-comorbid MIS; 16.4% reported primary MHSU and 14.8% reported secondary MHSU.

In comparison, the prevalence of MHSU at S2 among those who reported comorbidity at S1 was continuously higher: 19.2% reported primary or secondary MHSU in S2. However, the prevalence estimates of MHSU among those reporting non-comorbid MIS in S2 were substantially lower than the equivalent S1 estimates; among those reporting non-comorbid MIS in S1, 7.5% reported primary MHSU, and 8.3% reported secondary MHSU in S2.

The prevalence of MHSU among those reporting no MIS was comparatively low; approximately 4% reported use of either primary or secondary care services in both S1 and S2.

Table 27 also shows tests of associations between comorbidity and primary and secondary MHSU at S1 and S2 in separate multinomial regression models. The S1 analyses indicated that although associations between comorbidity and MHSU were stronger than the association between non-comorbid MIS and MHSU, they were not statistically different. In contrast, the comorbidity group was statistically more likely to report both primary and secondary MHSU at S2 compared to those reporting non-comorbid MIS as well as those reporting no MIS at S1. The non-comorbid MIS group was at greater relative risk of reporting secondary MHSU at S2 compared to the no MIS group, but were no more likely to use primary care services only.

Post-hoc analyses replicated the analyses above using the 4-categorical MIS-physical comorbidity variable (used in Chapter 3), in order to examine whether grouping the non-comorbid physical category with the no identified illness

category was appropriate with respect to MHSU. As anticipated, the non-comorbid physical illness group did not report greater MHSU from either primary or secondary care sectors than the no identified illness group, neither at S1 nor S2 (analyses not shown).

Table 27 Unadjusted cross-sectional and longitudinal associations between comorbidity and 12-month mental health service use

| | No MHSU | | | Primary MHSU only | | | | Secondary MHSU[a] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR (95% CI) | *p* | n | % | RRR | (95% CI) | *p* | $X^2$ |
| ***Mental health service use (S1)*** | **(n=1406)** | | | **(n=143)** | | | | **(n=135)** | | | | | |
| **Comorbidity (S1)** | | | | | | | | | | | | | |
| No identified illness | 1085 | 91.1 | | 53 | 4.6 | 1.00 | | 49 | 4.3 | 1.00 | | | <0.001 |
| Non-comorbid MIS | 166 | 68.8 | 1.00 | 39 | 16.4 | 4.77 (3.04-7.51) | <0.001 | 37 | 14.8 | 4.51 | (2.75-7.41) | <0.001 | |
| MIS-physical comorbidity | 143 | 60.5 | 1.00 | 50 | 21.0 | 6.95 (4.45-10.85) | <0.001 | 47 | 18.5 | 6.40 | (4.06-10.09) | <0.001 | |
| ***Mental health service use (S2)*** | **(n=884)** | | | **(n=75)** | | | | **(n=75)** | | | | | |
| **Comorbidity (S1)** | | | | | | | | | | | | | |
| No identified illness | 667 | 91.1 | | 32 | 4.6 | 1.00 | | 34 | 4.3 | 1.00 | | | <0.001 |
| Non-comorbid MIS | 120 | 84.2 | 1.00 | 11 | 7.5 | 1.69[b] (0.82-3.47) | 0.157 | 12 | 8.3 | 2.04[b] | (1.01-4.11) | 0.046 | |
| MIS-physical comorbidity | 91 | 61.7 | 1.00 | 31 | 19.2 | 6.30[b] (3.63-10.96) | <0.001 | 29 | 19.2 | 6.49[b] | (3.74-11.27) | <0.001 | |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure; (S2), S2 measure

*p*-value estimates from Chi-square tests apply Rao & Scott corrections.

"No MHSU" represents the reference category in the multinomial regression.

[a] Includes those who reported use of primary, as well as secondary services.

[b] The contrasts between the non-comorbid MIS and the MIS-physical comorbidity groups were significant at $p<0.05$

### 4.5.2 Comorbidity and mental health service use patterns

Table 28 shows the prevalence distribution of MHSU patterns by comorbidity, and tests the associations between them. The prevalence of continuous MHSU was 27.2% among those reporting comorbidity, and nearly three times as high at those reporting non-comorbid MIS in S1. The prevalence of initiated MHSU at S2 among those reporting comorbidity was also elevated. Fourteen percent of those reporting MIS-physical comorbidity and 7.4% of those reporting non-comorbid MIS reported initiated MHSU at S2. Those reporting non-comorbid MIS were more than twice as likely to report discontinued use of services as the comorbidity group. The prevalence of discontinued, initiated and continuous MHSU was markedly lower among those reporting no MIS, compared to the non-comorbid and comorbid MIS groups.

The regression model indicated that, relative to the reference of no MHSU, the comorbidity group was at greater risk of reporting both continuous and S2 initiated MHSU, compared to the no MIS or non-comorbid MIS groups. The MIS-physical comorbidity group was at over 12 times the relative risk of reporting MHSU at both timepoints compared to those reporting no MIS. The association between non-comorbid MIS and discontinued MHSU was stronger than the association between comorbidity and discontinued MHSU, but the associations were not statistically different from each other (analyses not shown).

Post-hoc analyses repeated the above described regression analyses using the 4-categorical comorbidity variable, and indicated that the non-comorbid physical illness group was no different from the no MIS group in its association with any of the MHSU outcomes, relative to the reference of no MHSU (analyses not shown).

Table 28 Unadjusted associations between comorbidity and mental health service use patterns (N=1045)

| | No MHSU (n=785) | | | Discontinued MHSU (n=99) | | | S2 initiated MHSU (n=81) | | | Continuous MHSU (n=87) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n % (95% confidence intervals) | | | | | | | | | | | | $X^2$ |
| ***Comorbidity (S1)*** | | | | | | | | | | | | | <0.001 |
| No MIS | 621 | 83.5 | (80.5-86.0) | 46 | 6.3 | (4.7-8.4) | 48 | 6.5 | (4.9-8.6) | 28 | 3.7 | (2.6-5.4) | |
| Non-comorbid MIS | 86 | 58.4 | (50.2-66.2) | 34 | 24.7 | (18.1-32.6) | 11 | 7.4 | (4.2-13.0) | 14 | 9.5 | (5.6-15.5) | |
| MIS-physical comorbidity | 72 | 46.8 | (39.0-54.8) | 19 | 12.0 | (7.7-18.3) | 22 | 14.0 | (9.3-20.4) | 44 | 27.2 | (20.6-34.9) | |
| | Relative risk ratio (95% confidence intervals) *p* | | | | | | | | | | | | |
| No MIS | | | | 1.00 | | | 1.00 | | | 1.00 | | | |
| Non-comorbid MIS | 1.00 | | | 5.58 | (3.36-9.28) | <0.001 | 1.64[a] | (0.82-3.30) | 0.165 | 3.60[a] | (1.80-7.23) | <0.001 | |
| MIS-physical comorbidity | 1.00 | | | 3.39 | (1.85-6.21) | <0.001 | 3.85[a] | (2.17-6.82) | <0.001 | 12.93[a] | (7.42-22.52) | <0.001 | |

CI, confidence interval; MIS, mental illness symptoms

*p*-value estimates from Chi-square tests apply Rao & Scott corrections.

"No MHSU" represents the reference category in the multinomial regression.

[a] The contrasts between the non-comorbid MIS and the MIS-physical comorbidity groups were significant at $p<0.05$

### 4.5.3 Comorbidity and mental health service quality in primary care

Preliminary analyses examined the distribution of Lambeth and Southwark surgeries across national tertiles of the six quality variables used (Table B2, Appendix B). A greater proportion of Lambeth and Southwark practices were located in the low quality tertiles for nearly all of the quality variables, while fewer practices were found in the high quality tertiles. However, high quality practices were not completely absent; at least 20% of the local practices performed among the top third of practices nationally on all of the mental health indicators.

Cross-tabulating the quality variables by comorbidity suggested no substantial variation in quality (Table 29). Regression analyses further indicated that neither the non-comorbid nor the comorbid groups were more likely to be registered with practices that were of better or worse quality compared to those reporting no identified illness.

Table 29 Quality of primary care services by comorbidity status among a subset of S1 respondents (N=1198)

| | | National QOF tertiles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low | | | Moderate | | | | High | | | | |
| **Comorbidity (S1)** | N | n | % | RRR | n | % | RRR (95% CI) | *p* | n | % | RRR (95% CI) | *p* | $X^2$ |
| | | | | | | | ***Overall QOF achievement*** | | | | | | 0.848 |
| No identified illness | 833 | 384 | 45.9 | | 347 | 41.9 | 1.00 | | 102 | 12.2 | 1.00 | | |
| Non-comorbid MIS | 161 | 75 | 47.1 | 1.00 | 66 | 41.2 | 0.96 (0.65-1.41) | 0.828 | 20 | 11.7 | 0.93 (0.51-1.71) | 0.819 | |
| MIS-physical comorbidity | 194 | 83 | 43.9 | 1.00 | 83 | 40.9 | 1.02 (0.71-1.47) | 0.919 | 28 | 15.2 | 1.30 (0.76-2.22) | 0.332 | |
| | | | | | | | ***Overall clinical achievement*** | | | | | | 0.492 |
| No identified illness | 833 | 301 | 35.8 | | 349 | 42.3 | 1.00 | | 183 | 22.0 | 1.00 | | |
| Non-comorbid MIS | 161 | 55 | 34.3 | 1.00 | 74 | 46.5 | 1.15 (0.76-1.73) | 0.509 | 32 | 19.2 | 0.91 (0.55-1.50) | 0.711 | |
| MIS-physical comorbidity | 194 | 57 | 29.7 | 1.00 | 90 | 45.7 | 1.30 (0.87-1.94) | 0.194 | 47 | 24.6 | 1.34 (0.85-2.11) | 0.201 | |
| | | | | | | | ***Combined achievement of mental health and depression domains*** | | | | | | 0.540 |
| No identified illness | 833 | 239 | 27.7 | | 338 | 40.8 | 1.00 | | 256 | 31.5 | 1.00 | | |
| Non-comorbid MIS | 161 | 52 | 31.1 | 1.00 | 69 | 43.6 | 0.95 (0.62-1.45) | 0.819 | 40 | 25.4 | 0.72 (0.44-1.16) | 0.179 | |
| MIS-physical comorbidity | 194 | 48 | 24.9 | 1.00 | 81 | 41.0 | 1.12 (0.72-1.74) | 0.618 | 65 | 34.1 | 1.20 (0.76-1.90) | 0.427 | |
| | | | | | | | ***Mental health domain achievement*** | | | | | | 0.824 |
| No identified illness | 833 | 241 | 27.7 | | 329 | 39.8 | | | 263 | 32.5 | | | |
| Non-comorbid MIS | 161 | 50 | 30.7 | 1.00 | 61 | 39.0 | 0.88 (0.57-1.37) | 0.580 | 50 | 30.3 | 0.84 (0.53-1.33) | 0.455 | |
| MIS-physical comorbidity | 194 | 48 | 25.7 | 1.00 | 76 | 38.5 | 1.04 (0.67-1.61) | 0.856 | 70 | 35.7 | 1.18 (0.76-1.83) | 0.459 | |
| | | | | | | | ***Depression domain achievement*** | | | | | | 0.563 |
| No identified illness | 833 | 325 | 39.1 | | 315 | 37.5 | 1.00 | | 193 | 23.2 | 1.00 | | |
| Non-comorbid MIS | 161 | 73 | 44.1 | 1.00 | 57 | 36.0 | 0.86 (0.57-1.28) | 0.449 | 31 | 20.0 | 0.77 (0.47-1.24) | 0.287 | |
| MIS-physical comorbidity | 194 | 69 | 34.8 | 1.00 | 81 | 41.2 | 1.24 (0.84-1.83) | 0.279 | 44 | 24.0 | 1.17 (0.75-1.84) | 0.490 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***Achievement on indicator of depression screening in chronic physical conditions*** | | | | | | 0.264 | | | | | |
| No identified illness | 833 | 353 | 43.0 | | 275 | 32.3 | 1.00 | | 205 | 24.7 | 1.00 | | |
| Non-comorbid MIS | 161 | 72 | 41.8 | 1.00 | 56 | 36.6 | 1.16 (0.77-1.76) | 0.466 | 33 | 21.7 | 0.90 (0.56-1.44) | 0.668 | |
| MIS-physical comorbidity | 194 | 76 | 38.8 | 1.00 | 57 | 29.7 | 1.02 (0.67-1.55) | 0.934 | 61 | 31.5 | 1.41 (0.94-2.13) | 0.096 | |

QOF, Quality Outcomes framework, RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms.
*p*-value estimates from Chi-square tests apply Rao & Scott corrections.
The lowest national QOF quartile represents the reference category in the multinomial regression.

## 4.6 Results of Aim 2.3: Associations between comorbidity and perceived health and functioning

Aim 2.3 sought to test the association between comorbidity and perceived health and functioning. The results from these analyses are presented separately for the S1 sample and the S2 sample.

### 4.6.1 Comorbidity and perceived health and functioning in S1

Unadjusted associations between comorbidity and indicators of health and functioning in the S1 sample are shown in Table 30. In comparison to the no MIS group, those in the comorbidity group reported greater somatic symptom severity, worse self-rated health, greater perceived functioning impairment and more daily functioning problems. The associations between comorbidity and poor perceived health and functioning were strong, with effect sizes larger than 10. The association between comorbidity and somatic symptom severity was particularly strong; those in the MIS-physical comorbidity group were nearly at 55 times greater risk of placement in the high somatic symptom severity category, relative to the low group, despite that the regression model was robust in terms of cell size (n of all cells <40). The comorbidity group also reported greater somatic symptom severity, worse-self-rated health, and greater functioning impairments than the non-comorbid MIS group. Nevertheless, those in the non-comorbid MIS group reported worse health and functioning compared to the no MIS group on all of the indicators except for daily functioning problems.

Table 30 Unadjusted associations[a] between comorbidity and perceived health and functioning in the S1 sample (N=1698)

| **Comorbidity (S1)** | N | n | % | RRR /OR | n | % | RRR /OR | (95% CI) | *p* | n | % | RRR (95% CI) | *p* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ***Somatic symptom severity (S1)*** | | | | | | |
| | | *Low*[c] | | | | | *Moderate* | | | | | *High* | |
| No MIS | 1192 | 878 | 72.7 | | 270 | 23.3 | 1.00 | | | 41 | 4.0 | 1.00 | |
| Non-comorbid MIS | 247 | 94 | 37.1 | 1.00 | 106 | 43.2 | 3.63[b] | (2.62-5.04) | <0.001 | 47 | 19.6 | 9.67[b] (5.85-15.97) | <0.001 |
| MIS-physical comorbidity | 242 | 43 | 16.4 | 1.00 | 83 | 34.5 | 6.56[b] | (4.28-10.07) | <0.001 | 114 | 49.1 | 54.73[b] (33.02-90.72) | <0.001 |
| | | | | | | | ***Self-rated health (S1)*** | | | | | | |
| | | *Good/Very good/excellent* | | | | | *Fair/poor* | | | | | | |
| No MIS | 1192 | 1079 | 89.9 | | 110 | 10.1 | 1.00 | | | | | | |
| Non-comorbid MIS | 247 | 197 | 79.8 | 1.00 | 50 | 20.2 | 2.26[b] | (1.54-3.32) | <0.001 | | | | |
| MIS-physical comorbidity | 242 | 107 | 41.9 | 1.00 | 133 | 58.1 | 12.42[b] | (8.82-17.49) | <0.001 | | | | |
| | | | | | | | ***Perceived functioning limitations due to emotional health (S1)*** | | | | | | |
| | | *No* | | | | | *Yes* | | | | | | |
| No MIS | 1192 | 1108 | 93.2 | | 80 | 6.8 | 1.00 | | | | | | |
| Non-comorbid MIS | 247 | 148 | 59.2 | 1.00 | 98 | 40.8 | 9.40[b] | (6.51-13.56) | <0.001 | | | | |
| MIS-physical comorbidity | 242 | 120 | 48.3 | 1.00 | 119 | 51.7 | 14.62[b] | (10.16-21.04) | <0.001 | | | | |
| | | | | | | | ***Daily functioning problems (S1)*** | | | | | | |
| | | *0-1* | | | | | *2 or more* | | | | | | |
| No MIS | 1192 | 1153 | 96.8 | | 31 | 3.2 | 1.00 | | | | | | |
| Non-comorbid MIS | 247 | 233 | 94.5 | 1.00 | 13 | 5.5 | 1.72[b] | (0.88-3.39) | 0.114 | | | | |
| MIS-physical comorbidity | 242 | 186 | 73.7 | 1.00 | 54 | 26.3 | 10.67[b] | (6.61-17.23) | <0.001 | | | | |

RRR, relative risk ratio; OR, odds ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure

[a] Regression analyses are logistic regressions, with the exception of somatic symptom severity which were tested in multinomial regression models.

[b] The contrasts between the non-comorbid MIS and the MIS-physical comorbidity groups were significant at $p<0.05$

[c] Represents the reference category in the multinomial regression.

### 4.6.2 Comorbidity and perceived health and functioning in S2

In the S2 sample, all indicators of perceived health and functioning were associated with comorbidity, such that the comorbidity group reported poorer health and functioning than the no MIS reference group (Table 31). The associations between comorbidity and the indicators of perceived health and functioning were similar in strength or stronger than the associations observed in the S1 sample, with effect sizes of 10 or larger. Somatic symptom severity was, again, very strongly associated with comorbidity. As observed in the S1 sample, non-comorbid MIS was also associated with all indicators of perceived health and functioning except for daily functioning problems. Compared to non-comorbid MIS, those reporting MIS-physical comorbidity reported greater somatic symptom severity, worse self-rated health, and more daily functioning problems, but the groups were not statistically different in terms of perceived functioning limitations.

Table 31 Unadjusted associations[a] between comorbidity and perceived health and functioning in the S2 sample (N=1052)

| **Comorbidity (S1)** | N | n | % | RRR /OR | n | % | RRR /OR | (95% CI) | *p* | n | % | RRR (95% CI) | *p* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***Somatic symptom severity (S1)*** | | | | | | | | | | | |
| | | *Low[c]* | | | | | *Moderate* | | | | | *High* | |
| No MIS | 745 | 545 | 72.0 | | 165 | 23.0 | 1.00 | | | 32 | 5.0 | 1.00 | |
| Non-comorbid MIS | 145 | 55 | 37.9 | 1.00 | 62 | 41.6 | 3.42[b] | (2.26-5.19) | <0.001 | 28 | 20.5 | 7.81[b] (4.18-14.60) | <0.001 |
| MIS-physical comorbidity | 157 | 23 | 14.1 | 1.00 | 51 | 31.1 | 6.92[b] | (3.94-12.17) | <0.001 | 82 | 54.8 | 56.45[b] (30.45-104.65) | <0.001 |
| | | ***Self-rated health (S1)*** | | | | | | | | | | | |
| | | *Good/Very good/excellent* | | | | | *Fair/poor* | | | | | | |
| No MIS | 745 | 678 | 90.6 | | 64 | 9.4 | 1.00 | | | | | | |
| Non-comorbid MIS | 145 | 118 | 81.7 | 1.00 | 27 | 18.3 | 2.15[b] | (1.31-3.54) | 0.003 | | | | |
| MIS-physical comorbidity | 157 | 71 | 42.3 | 1.00 | 85 | 57.7 | 13.11[b] | (8.58-20.04) | <0.001 | | | | |
| | | ***Perceived functioning limitations due to emotional health (S1)*** | | | | | | | | | | | |
| | | *No* | | | | | *Yes* | | | | | | |
| No MIS | 745 | 700 | 93.9 | | 42 | 6.1 | 1.00 | | | | | | |
| Non-comorbid MIS | 145 | 85 | 57.4 | 1.00 | 60 | 42.6 | 11.39 | (7.00-18.54) | <0.001 | | | | |
| MIS-physical comorbidity | 157 | 83 | 52.7 | 1.00 | 72 | 47.3 | 13.77 | (8.64-21.96) | <0.001 | | | | |
| | | ***Daily functioning problems (S1)*** | | | | | | | | | | | |
| | | *0-1* | | | | | *2 or more* | | | | | | |
| No MIS | 745 | 723 | 97.0 | | 19 | 3.0 | 1.00 | | | | | | |
| Non-comorbid MIS | 145 | 138 | 95.2 | 1.00 | 7 | 4.8 | 1.62[b] | (0.65-4.08) | 0.303 | | | | |
| MIS-physical comorbidity | 157 | 123 | 75.8 | 1.00 | 33 | 24.2 | 10.33[b] | (5.67-18.84) | <0.001 | | | | |

RRR, relative risk ratio; OR, odds ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure; (S2), S2 measure

[a] Regression analyses are logistic regressions, with the exception of somatic symptom severity which were tested in multinomial regression models.

[b] The contrasts between the non-comorbid MIS and the MIS-physical comorbidity groups were significant at $p<0.05$

[c] Represents the reference category in the multinomial regression.

## 4.7 Results of Aim 2.4: Associations between perceived health and functioning and service use outcomes

Aim 2.4 set out to test associations between potential mediators of MHSU and MHSU outcomes. Given that comorbidity was associated with all MHSU outcomes (2.2) and all indicators of perceived health and functioning (2.3), associations between all health and functioning indicators were tested with all 3 MHSU outcomes.

### 4.7.1 Associations between perceived health and functioning and primary and secondary mental health service use in S1

The unadjusted multinomial regression models describing the association between potential mediators with primary and secondary MHSU in S1 are shown in Table 32. All of the indicators of perceived health and functioning were associated with elevated risk of placement in the primary and secondary MHSU outcome categories. Somatic symptom severity was particularly strongly associated with primary MHSU; those reporting high somatic symptom severity were at over six times the risk of being placed in the primary MHSU category, relative to no MHSU. Perceived functioning limitations due to emotional health were the perceived health and functioning indicator most strongly associated with secondary MHSU. Those reporting such limitations were at over 5 times greater relative risk of placement in the secondary MHSU category.

### 4.7.2 Associations between perceived health and functioning and S2 mental health service use

The unadjusted associations between potential mediators with primary and secondary MHSU in S2 are shown in Table 33. All indicators of perceived health and functioning except for daily functioning problems were associated with both primary and secondary MHSU in S2. Daily functioning problems at S1 were associated with primary MHSU in S2, but not secondary MHSU. As with MHSU in S1, somatic symptom severity and perceived functioning limitations were strongly associated with primary and secondary MHSU, respectively.

Table 32 Unadjusted associations between perceived health and functioning and 12-month mental health service use (S1) (N=1698)

| | No MHSU (n=1406) | | | Primary MHSU only (n=143) | | | | | Secondary MHSU[a] (n=135) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR | (95% CI) | *p* | n | % | RRR | (95% CI) | *p* |
| ***Somatic symptom severity (S1)*** | | | | | | | | | | | | | |
| Low | 917 | 90.3 | | 46 | 4.6 | 1.00 | | | 53 | 5.1 | 1.00 | | |
| Moderate | 359 | 77.6 | 1.00 | 49 | 11.0 | 2.76 | (1.77-4.29) | <0.001 | 50 | 11.4 | 2.62 | (1.71-4.01) | <0.001 |
| High | 124 | 63.8 | 1.00 | 47 | 22.4 | 6.83 | (4.28-10.92) | <0.001 | 30 | 13.7 | 3.83 | (2.32-6.34) | <0.001 |
| ***Self-rated health (S1)*** | | | | | | | | | | | | | |
| Good/Very good/excellent | 1201 | 86.7 | | 89 | 6.6 | 1.00 | | | 94 | 6.7 | 1.00 | | |
| Fair/poor | 200 | 68.7 | 1.00 | 53 | 18.1 | 3.48 | (2.38-5.08) | <0.001 | 39 | 13.2 | 2.48 | (1.63-3.75) | <0.001 |
| ***Perceived functioning limitations due to emotional health (S1)*** | | | | | | | | | | | | | |
| No | 1223 | 88.3 | | 85 | 6.4 | 1.00 | | | 71 | 5.3 | 1.00 | | |
| Yes | 174 | 61.1 | 1.00 | 57 | 19.5 | 4.40 | (2.99-6.49) | <0.001 | 60 | 19.4 | 5.34 | (3.63-7.87) | <0.001 |
| ***Daily functioning problems (S1)*** | | | | | | | | | | | | | |
| 0-1 | 1325 | 84.3 | | 123 | 8.0 | 1.00 | | | 120 | 7.7 | 1.00 | | |
| 2 or more | 66 | 68.1 | 1.00 | 19 | 19.5 | 3.02 | (1.71-5.36) | <0.001 | 13 | 12.3 | 1.99 | (1.05-3.79) | 0.036 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms
"No MHSU" represents the reference category in the multinomial regression.
[a] Includes those who reported use of primary, as well as secondary services.

Table 33 Unadjusted associations between potential mediators and 12-month mental health service use (S2) (N=1052)

| | No MHSU (n=884) | | | Primary MHSU only (n=75) | | | | | Secondary MHSU[a] (n=75) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR | (95% CI) | *p* | n | % | RRR | (95% CI) | *p* |
| ***Somatic symptom severity (S1)*** | | | | | | | | | | | | | |
| Low | 569 | 92.4 | | 15 | 2.7 | 1.00 | | | 32 | 4.9 | 1.00 | | |
| Moderate | 218 | 79.3 | 1.00 | 34 | 12.5 | 5.49 | (2.90-10.40) | <0.001 | 22 | 8.2 | 1.93 | (1.06-3.50) | 0.032 |
| High | 93 | 69.7 | 1.00 | 24 | 16.6 | 8.29 | (4.15-16.54) | <0.001 | 20 | 13.7 | 3.68 | (1.96-6.92) | <0.001 |
| ***Self-rated health (S1)*** | | | | | | | | | | | | | |
| Good/Very good/excellent | 760 | 88.8 | | 47 | 5.7 | 1.00 | | | 48 | 5.4 | 1.00 | | |
| Fair/poor | 121 | 70.7 | 1.00 | 26 | 14.7 | 3.22 | (1.89-5.50) | <0.001 | 26 | 14.6 | 3.38 | (1.98-5.78) | <0.001 |
| ***Perceived functioning limitations due to emotional health (S1)*** | | | | | | | | | | | | | |
| No | 766 | 89.3 | | 46 | 5.6 | 1.00 | | | 44 | 5.1 | 1.00 | | |
| Yes | 114 | 68.6 | 1.00 | 27 | 15.6 | 3.62 | (2.13-6.14) | <0.001 | 29 | 15.8 | 4.07 | (2.43-6.81) | <0.001 |
| ***Daily functioning problems (S1)*** | | | | | | | | | | | | | |
| 0-1 | 839 | 86.5 | | 62 | 6.6 | 1.00 | | | 68 | 6.9 | 1.00 | | |
| 2 or more | 40 | 70.7 | 1.00 | 11 | 18.9 | 3.51 | (1.67-7.36) | <0.001 | 6 | 10.3 | 1.84 | (0.74-4.55) | 0.189 |

RRR, relative risk ratio; CI, confidence interval; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures

"No MHSU" represents the reference category in the multinomial regression.

[a] Includes those who reported use of primary, as well as secondary services.

### 4.7.3 Associations between perceived health and functioning and mental health service use patterns (S1+S2)

Associations between perceived health and functioning indicators and MHSU patterns are presented in Table 34 (frequency and prevalence distributions are shown in Table B3, Appendix B). All indicators of perceived health and functioning were strongly associated with continuous MHSU. High somatic symptom severity and perceived functioning limitations were the hypothesised mediators which exhibited particularly strong associations with continuous MHSU, with effect sizes of over eight. All indicators but daily functioning problems were also associated with discontinued MHSU, relative to no MHSU, but the effect sizes were smaller than those observed for continuous MHSU. Of the perceived health and functioning indicators, only somatic symptom severity and self-rated health were associated with S2 initiated MHSU.

Table 34 Unadjusted associations between perceived health and functioning and mental health service use patterns (N=1034)

| | **No MHSU (n=785)** | **Discontinued MHSU (n=99)** | | **S2 initiated MHSU (n=81)** | | **Continuous MHSU (n=87)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (96% CI) | *p* | RRR (96% CI) | *p* | RRR (96% CI) | *p* |
| ***Somatic symptom severity (S1)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 1.78 (1.08-2.94) | 0.024 | 2.85 (1.66-4.91) | <0.001 | 3.53 (1.98-6.30) | <0.001 |
| High | 1.00 | 3.50 (2.01-6.10) | <0.001 | 4.18 (2.20-7.97) | <0.001 | 8.70 (4.78-15.86) | <0.001 |
| ***Fair/poor self-rated health (S1)*** | 1.00 | 2.46 (1.46-4.16) | <0.001 | 2.82 (1.63-4.86) | <0.001 | 4.66 (2.82-7.69) | <0.001 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 3.08 (1.85-5.11) | <0.001 | 1.51 (0.79-2.87) | 0.208 | 9.27 (5.59-15.37) | <0.001 |
| ***2 or more daily functioning problems (S1)*** | 1.00 | 1.41 (0.59-3.41) | 0.441 | 1.76 (0.71-4.36) | 0.218 | 4.25 (2.14-8.42) | <0.001 |

RRR, relative risk ratio; CI, confidence interval; (S1), S1 measure
"No MHSU" represents the reference category in the multinomial regression.

## 4.8 Results of Aim 2.5: The mediating effect of perceived health and functioning in associations between comorbidity and mental health service use

### 4.8.1 Mediation modelling of comorbidity and primary and secondary mental health service use in S1

#### 4.8.1.1 Mediation testing

The first 3 steps of mediation were performed in analyses addressing aims 2.2-2.4. First, an association was established between comorbidity and both primary and secondary MHSU in S1 (aim 2.2, Table 27). Second, it was demonstrated that comorbidity was associated with all hypothesised health and functioning mediators (aim 2.3, Table 30). Finally, all health related indicators were associated with both primary and secondary MHSU in S1 (aim 2.4, Table 32). Thus, all perceived health and functioning indicators were considered potential mediators.

The results from the 3-variable mediation models are presented in Table 35. In order to be considered a mediator a health or functioning indicator needed to show a significant association with a MHSU outcome category and also substantially attenuate the association between comorbidity and the same MHSU outcome category. The indicators that demonstrated a mediating effect in the association between comorbidity and primary MHSU included somatic symptom severity, self-rated health and perceived functioning limitations due to emotional health. These variables also mediated the association between non-comorbid MIS and primary MHSU.

The only indicator of perceived health and functioning that demonstrated a mediating effect on the association between comorbidity and secondary MHSU was perceived functioning limitations due to emotional health. Perceived functioning limitations also mediated the association between non-comorbid MIS and secondary MHSU. In contrast, no mediating effect of daily functioning problems was observed in any of the associations of interest. Therefore this perceived functioning indicator was excluded from subsequent analyses.

Post-hoc analyses tested the health and functioning mediators in a model simultaneously testing all perceived health and functioning indicators factors

which demonstrated a mediating effect in the three-variable models (i.e. somatic symptom severity, self-rated health and perceived functioning limitations due to emotional health). In the block-adjusted mediation model, moderate and high somatic symptom severity and perceived functioning limitations remained associated with greater primary MHSU ($p=0.048$, $p=0.014$, $p=0.015$, respectively; analyses not shown). Perceived functioning limitations also remained associated with secondary MHSU ($p<0.001$; analyses not shown). Self-rated health on the other hand, was no longer associated with primary MHSU ($p=0.130$). Additional analyses indicated that somatic symptom severity and perceived functioning limitations accounted for the attenuation of the association of self-rated health (analyses not shown). Self-rated health was thus not carried forward to the fully adjusted model.

Table 35 Testing perceived health and functioning indicators for mediation in cross-sectional associations of comorbidity and mental health service use (S1) (N=1698)

| | No MHSU (n=1406) | Primary MHSU only (n=143) | | Secondary MHSU[a] (n=135) | |
|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| **Mediation model: somatic symptom severity (N=1664)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 3.61[b] (2.23-5.83) | <0.001 | 4.05 (2.32-7.06) | <0.001 |
| MIS-physical comorbidity | 1.00 | 4.15[b] (2.44-7.05) | <0.001 | 5.67 (3.18-10.09) | <0.001 |
| ***Somatic symptom severity (S1)*** | | | | | |
| Low | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 1.84 (1.16-2.94) | 0.010 | 1.61 (0.97-2.66) | 0.064 |
| High | 1.00 | 2.82 (1.61-4.94) | <0.001 | 1.29 (0.68-2.43) | 0.439 |
| **Mediation model: self-rated health (N=1664)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.46[b] (2.85-6.98) | <0.001 | 4.50 (2.73-7.44) | <0.001 |
| MIS-physical comorbidity | 1.00 | 5.25[b] (3.29-8.36) | <0.001 | 6.00 (3.64-9.90) | <0.001 |
| ***Fair/poor self-rated health (S1)*** | 1.00 | 1.83 (1.22-2.73) | 0.003 | 1.23 (0.77-1.98) | 0.386 |
| **Mediation model: perceived functioning limitations due to emotional health (N=1661)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 3.74[b] (2.32-6.03) | <0.001 | 3.12[b] (1.74-5.61) | <0.001 |
| MIS-physical comorbidity | 1.00 | 5.13[b] (3.19-8.24) | <0.001 | 3.99[b] (2.35-6.77) | <0.001 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 2.07 (1.36-3.16) | <0.001 | 2.81 (1.74-4.55) | <0.001 |
| **Mediation model: *Daily functioning problems* (N=1658)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.72 (3.01-7.41) | <0.001 | 4.60 (2.79-7.59) | <0.001 |
| MIS-physical comorbidity | 1.00 | 6.30 (3.92-10.14) | <0.001 | 6.58 (4.05-10.71) | <0.001 |
| ***2 or more daily functioning problems (S1)*** | 1.00 | 1.53 (0.81-2.92) | 0.193 | 0.99 (0.48-2.04) | 0.982 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure
"No MHSU" represents the reference category in the multinomial regression.
[a] Includes those who reported use of primary, as well as secondary services.
[b] ≥10% change from unadjusted unexponentiated coefficient

#### 4.8.1.2 Mediation testing in fully adjusted models

##### 4.8.1.2.1 Selecting explanatory factors

A 4-stage process of selecting explanatory factors was applied (outlined in section 4.2.2.4.2). The analyses for steps 1, 2 and 4 are presented in Table B4, Table B5, Table B6, and Table B7 in Appendix B (analyses for step 3 are not shown). The variables carried forward to the fully adjusted model based on the reduction process were: ethnicity, education, employment, benefits receipt, social network size and stressful life events. Gender and age were a priori decided to be included in the fully adjusted model.

Relationship status was dropped, as it was not associated with the MHSU outcome categories and did not influence the coefficients between comorbidity and the outcomes in the 3-variable model (analyses not shown). Similarly, in a 3-variable model debt did not exert any influence on any of the associations of interest and was not associated with either of the MHSU outcomes, and was thus dropped from subsequent analyses (analyses not shown). Block-adjusted models indicated that migrant status, household income and social support were not associated with either of the MHSU outcome categories (Table B7, Appendix B). These were therefore not carried forward to the fully-adjusted model.

##### 4.8.1.2.2 Adjusted mediation model of comorbidity and primary and secondary mental health service use at S1

After adjusting for explanatory factors, the mediating variables observed in the 3-variable models remained significantly associated with the respective MHSU outcomes. Those reporting moderate and high symptom severity were at 66% and 99% increased relative risk of reporting primary MHSU, respectively, while those reporting perceived functioning limitations due to emotional health were at 59% elevated risk of placement in the primary MHSU group, relative to no MHSU. Indeed, these were the only indicators statistically associated with primary MHSU, although associations between small social networks (compared to networks of 3-4 contacts) and stressful life events were also strong.

Perceived functioning limitations due to emotional health remained strongly associated with secondary MHSU in the adjusted model. Also those reporting six or more stressful life events were associated with over 4 times elevated relative risk of placement in the secondary MHSU category. Women were also at elevated risk of secondary MHSU, while those from ethnic minority groups were at lower relative risk of placement in the secondary MHSU group.

MIS, whether with or without physical comorbidity, remained the variable most strongly associated with both primary and secondary MHSU, after adjusting for potential mediators and explanatory factors. Although associations between comorbidity and the MHSU outcomes, particularly secondary MHSU, were stronger than the associations between non-comorbid MIS and the MHSU outcomes, the strength between the non-comorbidity and comorbidity associations were not substantially different (analyses not shown). The comorbidity group was also no more likely to use secondary MHSU, relative to primary MHSU, either compared to no MIS or non-comorbid MIS (analyses not shown).

Table 36 Fully-adjusted cross-sectional associations of comorbidity and mental health service use (S1) (N=1698)

| | **No MHSU (n=1406)** | **Primary MHSU only (n=143)** | | **Secondary MHSU[a] (n=135)** | |
|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Comorbidity (S1)*** | | | | | |
| No identified illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 2.87 (1.75-4.73) | <0.001 | 2.68 (1.40-5.13) | 0.003 |
| MIS-physical comorbidity | 1.00 | 3.05 (1.72-5.41) | <0.001 | 4.38 (2.31-8.32) | <0.001 |
| ***Somatic symptom severity (S1)*** | | | | | |
| Low | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 1.66 (1.03-2.69) | 0.038 | 1.24 (0.73-2.10) | 0.424 |
| High | 1.00 | 1.99 (1.07-3.71) | 0.031 | 0.87 (0.43-1.75) | 0.696 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 1.59 (1.00-2.52) | 0.048 | 2.66 (1.62-4.36) | <0.001 |
| ***Female (S1)*** | 1.00 | 1.23 (0.80-1.88) | 0.340 | 1.58 (1.03-2.44) | 0.038 |
| ***Age (continuous) (S1)*** | 1.00 | 0.99 (0.98-1.00) | 0.189 | 0.99 (0.97-1.00) | 0.116 |
| ***Non-White ethnicity (S1)*** | 1.00 | 0.83 (0.55-1.25) | 0.371 | 0.54 (0.33-0.88) | 0.014 |
| ***Education (S1)*** | | | | | |
| No qualifications | 1.00 | 1.20 (0.60-2.37) | 0.607 | 1.35 (0.57-3.17) | 0.492 |
| GCSE | 1.00 | 1.24 (0.64-2.39) | 0.529 | 1.58 (0.70-3.54) | 0.267 |
| A-level | 1.00 | 0.76 (0.39-1.50) | 0.432 | 2.66 (1.16-6.13) | 0.021 |
| Degree or above | | 1.00 | | 1.00 | |
| ***Employment status[b] (S1)*** | | | | | |
| Working | | 1.00 | | 1.00 | |
| Not working | 1.00 | 1.21 (0.74-1.97) | 0.455 | 1.15 (0.62-2.13) | 0.652 |
| Students | 1.00 | 0.66 (0.31-1.40) | 0.276 | 1.88 (0.98-3.62) | 0.059 |
| ***Benefits[c] (S1)*** | 1.00 | 1.39 (0.86-2.25) | 0.173 | 1.32 (0.76-2.27) | 0.322 |
| ***Social network size (S1)*** | | | | | |
| 2 or less contacts | | 1.00 | | 1.00 | |
| 3-4 contacts | 1.00 | 0.55 (0.30-1.00) | 0.051 | 0.57 (0.28-1.16) | 0.122 |
| 5 or more contacts | 1.00 | 0.68 (0.37-1.27) | 0.230 | 0.93 (0.47-1.86) | 0.842 |
| ***Stressful life events (S1)*** | | | | | |
| 0-2 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 1.61 (0.99-2.63) | 0.055 | 2.30 (1.32-4.00) | 0.003 |
| 6 or more | 1.00 | 1.65 (0.92-2.97) | 0.091 | 4.07 (2.13-7.78) | <0.001 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure
"No MHSU" represents the reference category in the multinomial regression.
[a] Includes those who reported use of primary, as well as secondary services.
[b] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness.
[c] Benefits are non-health related

### 4.8.2 Mediation modelling of comorbidity and primary and secondary mental health service use in S2

#### 4.8.2.1 Mediation analyses

Analyses addressing aims 2.2-2.4 performed the first 3 steps of mediation. These analyses indicated that comorbidity was associated with primary as well as secondary MHSU in S2 (aim 2.2, Table 27), and that comorbidity was associated with all potential health and functioning mediators (aim 2.3, Table 30). Furthermore, all perceived health and functioning indicators were associated with primary and secondary MHSU in S2 (aim 2.4, Table 33), and were thus considered potential mediators.

Mediation tests of the prospective association between comorbidity and MHSU indicated that perceived functioning limitations due to emotional health was the only indicator that demonstrated a mediating effect on the association between comorbidity and both primary and secondary MHSU (S2) (Table 37). The inclusion of perceived functioning limitations in the model substantially attenuated these associations. However, those reporting comorbidity remained at over 4 times higher relative risk of reporting both primary and secondary MHSU, indicating partial mediation. In contrast, perceived functioning limitations fully accounted for the association between non-comorbid MIS and secondary MHSU, suggesting a complete mediating effect.

Somatic symptom severity also partially mediated the association between comorbidity and primary MHSU. While self-rated health substantially attenuated the associations between comorbidity and both of the MHSU outcomes, it was not associated with either primary or secondary MHSU and did therefore not fulfil both mediation criteria. Daily functioning problems were not associated with either of the outcome categories, and did not influence any of the associations of interest either. Self-rated health and daily functioning problems were therefore not considered in further analyses.

Somatic symptom severity and perceived functioning limitations were jointly tested in a model with comorbidity. In this model, the association between moderate and high somatic symptom severity with primary MHSU persisted (RRR=4.33, $p<0.001$ for moderate somatic symptom severity; RRR=3.90, $p=0.002$ for high somatic symptom severity). Perceived functioning limitations

also remained associated with secondary MHSU (RRR=2.31, p=0.010; analyses not shown). Both the mediators were thus carried forward to analyses adjusting for additional explanatory factors.

Table 37 Testing perceived health and functioning indicators for mediation in longitudinal associations between comorbidity and mental health service use (S2) (N=1045)

| | **No MHSU (n=884)** | **Primary MHSU only (n=75)** | | **Secondary MHSU[a] (n=75)** | |
|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| **Mediation model: somatic symptom severity (N=1664)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified MIS | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.04[b] (0.49-2.21) | 0.909 | 1.97 (0.91-4.24) | 0.085 |
| MIS-physical comorbidity | 1.00 | 3.04[b] (1.58-5.86) | <0.001 | 6.01 (3.01-12.02) | <0.001 |
| ***Somatic symptom severity (S1)*** | | | | | |
| Low | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 4.52 (2.35-8.69) | <0.001 | 1.24 (0.65-2.37) | 0.507 |
| High | 1.00 | 4.30 (1.92-9.63) | <0.001 | 1.21 (0.54-2.70) | 0.645 |
| **Mediation model: self-rated health (N=1664)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified MIS | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.60[b] (0.77-3.33) | 0.209 | 2.00 (0.99-4.03) | 0.053 |
| MIS-physical comorbidity | 1.00 | 4.82[b] (2.51-9.24) | <0.001 | 5.22[b] (2.80-9.70) | <0.001 |
| ***Fair/poor self-rated health (S1)*** | 1.00 | 1.68 (0.89-3.18) | 0.112 | 1.72 (0.93-3.18) | 0.085 |
| **Mediation model: perceived functioning limitations due to emotional health (N=1661)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified MIS | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.24[b] (0.56-2.74) | 0.600 | 1.48[b] (0.63-3.46) | 0.364 |
| MIS-physical comorbidity | 1.00 | 4.50[b] (2.36-8.58) | <0.001 | 4.46[b] (2.40-8.29) | <0.001 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 2.14 (1.13-4.04) | 0.020 | 2.35 (1.26-4.38) | 0.007 |
| **Mediation model: daily functioning problems (N=1658)** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No identified MIS | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.66 (0.80-3.43) | 0.171 | 2.12 (1.05-4.28) | 0.037 |
| MIS-physical comorbidity | 1.00 | 5.41 (2.93-9.97) | <0.001 | 6.99 (3.93-12.42) | <0.001 |
| ***2 or more daily functioning problems (S1)*** | 1.00 | 1.69 (0.71-4.00) | 0.237 | 0.80 (0.30-2.14) | 0.658 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure
"No MHSU" represents the reference category in the multinomial regression.
[a] Includes those who reported use of primary, as well as secondary services.
[b] >10% change from unadjusted unexponentiated coefficient

#### 4.8.2.2 Mediation testing in fully adjusted models

##### 4.8.2.2.1 Selecting explanatory factors

The 4-step variable reduction process resulted in the following variables being carried forward as explanatory factors for inclusion in the fully-adjusted mediation models: MIS at S2, non-white ethnicity, migrant status, education, and stressful life events (analyses are presented in Table B8, Table B9, Table B10 and Table B11 in Appendix B; analyses for step 3 not shown). These were in addition to age and gender, which were decided a priori to be included in the fully-adjusted model.

Results from the 3-variable model of MIS at S2 suggested that it was an important confounder to consider, exerting substantial attenuation in the associations between comorbidity and MHSU outcomes, as well as being showing strong independent associations with both the MHSU outcomes ($p<0.001$, analyses not shown). Thus MIS at S2 was carried forward to the adjusted model.

Relationship status and chronic debt were dropped after being tested respective 3-variable models, as they did not exert any influence on the associations of interest or were associated with the MHSU outcomes (analyses not shown).

Adverse employment conditions, low household income and benefits receipt were not associated with either primary or secondary MHSU in S2 in block-adjusted socio-economic models and were thus dropped from further analyses (Table B11, Appendix B). The block-adjusted model testing social factors indicated that neither social support, social network size nor stressful life events were associated with MHSU and were thus not included in the adjusted analyses (Table B11, Appendix B).

None of the three variables of attitudes towards help-seeking for mental health problems were associated with comorbidity (Table B9, Appendix B). While treatment effectiveness perceptions were associated comorbidity, they were not associated with either primary or secondary MHSU (S2) (Table B10, Appendix B). Thus, none of the attitudinal indicators were considered plausible explanatory factors, and were dropped from subsequent analyses.

#### 4.8.2.2.2 Adjusted mediation model of comorbidity and primary and secondary mental health service use at S2

The adjusted mediation model of the prospective association between comorbidity and MHSU in S2 is shown in Table 38. Adjusting for explanatory factors, the association between comorbidity and primary MHSU was fully attenuated, however comorbidity remained strongly associated with secondary MHSU. Post-hoc comparisons indicated that the comorbidity group was at substantially greater relative risk of placement in the both the primary and secondary MHSU categories compared to those reporting non-comorbid MIS (RRR=3.75, p=0.005 for primary MHSU; RRR=3.24, p=0.006 for secondary MHSU, analyses not shown). However, the comorbidity group was not at greater risk of placement in the secondary MHSU groups relative to primary MHSU, compared to no MIS or non-comorbid MIS.

Somatic symptom severity remained associated with primary MHSU. Indeed, the association between moderate somatic symptom severity and primary MHSU was unchanged, while the association between high somatic symptom severity and primary MHSU was substantially attenuated but remained significantly associated with an effect size approaching 3 times the elevated relative risk. The strength of the association between perceived functioning limitations with secondary MHSU was also attenuated, but remained associated with an effect size of nearly doubled the relative risk.

MIS at S2 was the indicator most strongly associated with both primary and secondary MHSU at S2. Those reporting MIS at S2 were at approximately 8 times elevated relative risk of placement in both the primary and secondary S2 MHSU categories. Post-hoc analyses tested the same model excluding MIS at follow-up, indicating that comorbidity was associated with over 3 times greater relative risk of primary and secondary MHSU, compared to those reporting no MIS at S1 (RRR=3.14, p=0.003 for primary MHSU; RRR=4.15, p<0.001; for secondary MHSU; analyses not shown). In contrast, those reporting non-comorbid MIS at S1 were no more likely to use services at follow-up than those reporting no MIS (RRR=0.77, p=0.538, for primary MHSU; RRR=1.24, p=0.660 for secondary MHSU; analyses not shown). Thus, the persistence of MIS among the comorbidity group explained MHSU at follow up, more so than any other explanatory factor.

Other relevant covariates in the adjusted model included education, migrant status and ethnicity (Table 35). Those reporting lower educational qualifications were at lower relative risk of reporting both primary and secondary MHSU, and ethnic minority groups were at lower relative risk of reporting secondary MHSU. The lower uptake of secondary services was particularly low among Black ethnic minority groups. Post-hoc analyses found that 2.0% of Black Caribbean respondents and 2.9% of Black African respondents reported secondary MHSU, compared to 8.9% reporting secondary MHSU among White respondents (analyses not shown).

In contrast, migrants were at over twice an increased risk of reporting primary MHSU at S2, irrespective of their reported length of residence in the UK. Post-hoc analyses indicated that this observed effect among migrants was primarily driven by greater uptake of primary and secondary services by migrants of White ethnicity (≥10.7% and ≥16.0% reported primary and secondary MHSU among shorter and longer residing White migrants, respectively, vs. ≤7.8% among White non-migrants; analyses not shown), and to an extent Black African migrants reporting greater uptake of primary MHSU (8.9% and 15.6% of shorter and longer residing Black African migrants reported primary MHSU, respectively, vs. 3.9% among Black African non-migrants; analyses not shown).

Table 38 Fully-adjusted longitudinal associations of comorbidity and mental health service use (S2) (N=1052)

| | No MHSU (n=884) | Primary MHSU only (n=75) | | Secondary MHSU[a] (n=75) | |
|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Comorbidity (S1)*** | | | | | |
| No identified illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 0.45 (0.18-1.16) | 0.099 | 0.79 (0.29-2.13) | 0.640 |
| MIS-physical comorbidity | 1.00 | 1.71[b] (0.73-4.00) | 0.216 | 2.56[b] (1.13-5.78) | 0.024 |
| ***Somatic symptom severity (S1)*** | | | | | |
| Low | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 4.59 (2.30-9.16) | <0.001 | 1.02 (0.48-2.14) | 0.966 |
| High | 1.00 | 2.93 (1.20-7.15) | 0.018 | 0.87 (0.35-2.18) | 0.773 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 1.32 (0.62-2.77) | 0.471 | 1.93 (0.99-3.74) | 0.052 |
| ***MIS (S2)*** | 1.00 | 7.24 (3.72-14.11) | <0.001 | 7.34 (3.80-14.17) | <0.001 |
| ***Female gender (S1)*** | 1.00 | 1.27 (0.68-2.37) | 0.448 | 0.88 (0.50-1.52) | 0.641 |
| ***Age (continuous) (S1)*** | 1.00 | 0.99 (0.97-1.01) | 0.258 | 0.99 (0.97-1.01) | 0.285 |
| ***Non-White ethnicity (S1)*** | 1.00 | 1.01 (0.52-1.97) | 0.965 | 0.40 (0.18-0.87) | 0.020 |
| ***Migrant (S1)*** | | | | | |
| UK born | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 2.12 (1.01-4.44) | 0.046 | 0.75 (0.30-1.88) | 0.540 |
| ≥10 years in the UK | 1.00 | 2.71 (1.27-5.81) | 0.010 | 1.33 (0.64-2.80) | 0.446 |
| ***Education (S1+S2)*** | | | | | |
| No qualifications | 1.00 | 0.44 (0.15-1.25) | 0.123 | 0.26 (0.08-0.84) | 0.023 |
| GCSE | 1.00 | 0.40 (0.16-0.98) | 0.044 | 0.47 (0.20-1.10) | 0.081 |
| A-level | 1.00 | 1.06 (0.55-2.03) | 0.865 | 0.61 (0.30-1.23) | 0.167 |
| Degree or above | | 1.00 | | 1.00 | |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure; (S2), S2 measure

"No MHSU" represents the reference category in the multinomial regression.

[a] Includes those who reported use of primary, as well as secondary services.

### 4.8.3 Mediation modelling of comorbidity and mental health service use patterns over time

#### 4.8.3.1 Mediation testing

Comorbidity was associated with all the MHSU patterns outcomes, thus fulfilling the first mediation criterion (aim 2.2, Table 28). Subsequent analyses preparing for mediation (aims 2.3 and 2.4) indicated that all hypothesised mediators of perceived health and functioning fulfilled the second and third criteria of mediation. Comorbidity was associated with all potential health and functioning mediators (aim 2.3, Table 30), and all perceived health and functioning indicators were associated with at least one MHSU pattern outcome categories (aim 2.4, Table 34).

Tests of mediation found that somatic symptom severity and perceived functioning limitations due to emotional health mediated the associations between comorbidity and continuous MHSU, and non-comorbid MIS and continuous MHSU (Table 39). Although somatic symptom severity and perceived functioning limitations substantially attenuated the association between comorbidity and continuous MHSU, comorbidity remained strongly associated with continuous MHSU. This indicated partial mediation effects by these variables. The association between non-comorbid MIS and continuous MHSU was also partially mediated by somatic symptom severity, but fully mediated by perceived functioning limitations. Greater somatic symptom severity was also associated with greater risk of placement in the initiated MHSU category.

Daily functioning problems did not mediate any of the associations between comorbidity or non-comorbidity and continuous MHSU, and were therefore dropped from further analyses. Self-rated health did not mediate any of the associations between comorbidity or non-comorbidity with continuous MHSU. Self-rated health was on the other hand associated with elevated risk of placement in the discontinued and initiated MHSU categories.

Somatic symptom severity and perceived functioning limitations were thus tested in a block-adjusted model of perceived health and functioning mediators. Despite that self-rated health did not mediate the associations of interest it was also incorporated in the block-adjusted model in order to observe whether it

exerted independent effects on discontinued and initiated MHSU, whilst adjusting for the mediating variables. In the block-adjusted model perceived functioning limitations remained a significant mediator of continuous MHSU, with those reporting such limitations at 4 times elevated risk of placement in the continuous MHSU category, relative to no MHSU (RRR=4.00, $p<0.001$; analyses not shown). In contrast, moderate and high somatic symptom severity was no longer associated with greater risk of placement in the continuous MHSU group (RRR=1.66, $p=0.163$; and RRR=1.65, $p=0.252$, respectively; analyses not shown). Additional analyses indicated that the complete attenuation of these associations was accounted for by perceived functioning limitations due to emotional health (analyses not shown). Moderate somatic symptom severity was nevertheless associated with greater risk of placement in the initiated MHSU group (RRR=2.35, $p=0.003$; analyses not shown). Somatic symptom severity was therefore included as a potentially relevant confounder in the fully-adjusted model, rather than a mediator. Self-rated health was no longer associated with discontinued or initiated MHSU in the block-adjusted model (RRR=1.64, $p=0.100$; RRR=1.68, $p=0.082$, respectively; analyses not shown), and was therefore not used in subsequent analyses.

Table 39 Testing perceived health and functioning indicators for mediation in associations of comorbidity and continuity of mental health service use (N=1045)

| | No MHSU (n=785) | Discontinued MHSU (n=99) | | S2 initiated MHSU (n=81) | | Continuous MHSU (n=87) | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| **Mediation model: somatic symptom severity (N=1041)** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No identified illness | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.85 (2.77-8.49) | <0.001 | 1.26[a] (0.59-2.71) | 0.552 | 2.93[a] (1.39-6.15) | 0.005 |
| MIS-physical comorbidity | 1.00 | 2.41[a] (1.17-4.97) | 0.017 | 2.41[a] (1.20-4.83) | 0.014 | 8.72[a] (4.34-17.54) | <0.001 |
| ***Somatic symptom severity (S1)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 1.26 (0.71-2.21) | 0.428 | 2.46 (1.40-4.33) | 0.002 | 2.06 (1.07-3.95) | 0.031 |
| High | 1.00 | 1.91 (0.97-3.77) | 0.062 | 2.40 (1.08-5.32) | 0.032 | 2.28 (1.05-4.95) | 0.036 |
| **Mediation model: self-rated health (N=1041)** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No identified illness | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 5.32 (3.20-8.85) | <0.001 | 1.59[a] (0.79-3.19) | 0.196 | 3.59 (1.77-7.26) | <0.001 |
| MIS-physical comorbidity | 1.00 | 2.55[a] (1.33-4.87) | 0.005 | 2.77[a] (1.49-5.15) | 0.001 | 10.30 (5.40-19.65) | <0.001 |
| ***Fair/poor self-rated health (S1)*** | 1.00 | 1.85 (1.05-3.26) | 0.033 | 1.94 (1.08-3.47) | 0.026 | 1.78 (0.97-3.27) | 0.065 |
| **Mediation model: Perceived functioning limitations due to emotional health (N=1040)** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No identified illness | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.78 (2.83-8.07) | <0.001 | 1.72 (0.81-3.68) | 0.160 | 1.96[a] (0.88-4.40) | 0.102 |
| MIS-physical comorbidity | 1.00 | 2.91 (1.61-5.24) | <0.001 | 3.89 (2.10-7.22) | <0.001 | 6.78[a] (3.56-12.91) | <0.001 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 1.54 (0.92-2.57) | 0.097 | 0.90 (0.44-1.86) | 0.782 | 4.44 (2.42-8.13) | <0.001 |
| **Mediation model: *Daily functioning* problems (N=1041)** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***Comorbidity (S1)*** | | | | | | | |
| No identified illness | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 5.57 (3.35-9.26) | <0.001 | 1.67 (0.83-3.36) | 0.153 | 3.71 (1.84-7.48) | <0.001 |
| MIS-physical comorbidity | 1.00 | 3.39 (1.75-6.54) | <0.001 | 3.73 (2.01-6.92) | <0.001 | 12.10 (6.59-22.21) | <0.001 |
| ***2 or more daily functioning problems (S1)*** | 1.00 | 1.00 (0.38-2.60) | 0.992 | 1.06 (0.39-2.87) | 0.909 | 1.59 (0.68-3.74) | 0.284 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure
"No MHSU" represent the reference category in the multinomial regression.
[a] >10% change from unadjusted coefficient (not shown); not relative risk ratio)

#### 4.8.3.2 Mediation testing in fully adjusted models

##### 4.8.3.2.1 Selecting explanatory factors

As with the previous outcomes, the 4-step process of testing unadjusted associations, 3-variable models and block-adjusted models was performed in order to select explanatory factors (steps 1, 2 and 4 are shown in Table B8, Table B9, Table B12, Table B13 and Table B14 in Appendix B). As a result of the variable reduction process the following variables, in addition to somatic symptom severity, were selected as explanatory factors in the adjusted mediation models: MIS at S2, non-white ethnicity, migrant status, education, adverse employment conditions, benefits receipt, social network size, and stressful life events. In addition, age and gender were included in the fully-adjusted model based on an a priori decision.

Variables which were dropped at the 3-variable stage included relationship status, chronic debt and treatment benefit perceptions. These were not associated with the MHSU outcomes and did not influence any of the associations between comorbidity or non-comorbid MIS and the MHSU outcomes (analyses not shown).

The block-adjusted socio-demographic model indicated that longer UK-residing migrant status was associated with greater relative risk of placement in the initiated MHSU category (Table B14, Appendix B), despite that no associations between migrant status and any of the MHSU pattern outcomes were observed in the three-variable model (analyses not shown). Post-hoc analyses indicated that a combination of age and ethnicity contributed to the masking effect observed in the association between longer-residing migrants and initiated MHSU. Longer-stay migrants of White ethnicity and under the age of 50 were more likely to initiate MHSU compared to non-migrants of similar demographics. The greatest difference was found in the 40-49 year category, where twice the proportion of longer-residing migrants initiated MHSU, compared to UK born of the same age (analyses not shown). Thus, although ethnicity was not associated to an outcome category in the block-adjusted model, it was carried forward for inclusion in the fully-adjusted model, as the migrant effect was partially contingent on ethnicity.

Low household income and social support were dropped from further analysis as they were not associated with any of the outcome categories in respective block-adjusted models. Given that the indicators of attitudes towards help-seeking for mental health problems were not associated with comorbidity; these were also not considered in subsequent analyses as explanatory factors (Table B9, Appendix B).

#### 4.8.3.2.2 Adjusted mediation model of comorbidity and mental health service use patterns

In the fully adjusted model (Table 40), MIS-physical comorbidity remained significantly associated with elevated risk of continuous MHSU, relative to no MHSU, with an effect size approaching 3. In contrast, the association between non-comorbid MIS and continuous MHSU was fully attenuated. Post-hoc analyses tested the difference in relative risk between the non-comorbid and the comorbid MIS groups, indicating that the comorbidity group was at over 3 times higher risk of placement in the continuous MHSU category compared to those reporting non-comorbid MIS (RRR=3.27, p=0.013, analyses not shown). Relative to discontinued MIS, the comorbidity group was also at greater risk of continuous MHSU compared to non-comorbid MIS (RRR=5.46, p=0.001), but not compared to the no MIS group (RRR=1.09,p=0.878). Relative to S2 initiated MHSU, there were no differences between the comorbidity group and either the no MIS or the non-comorbid MIS group in terms of risk of placement in the continuous MHSU outcome category (RRR=1.73, p=0.307; RRR=1.37, p=0.595). Although slightly attenuated in the adjusted model, perceived functioning limitations remained strongly associated with continuous MHSU with an effect size of 3.

While those reporting comorbidity at S1 were at greater relative risk of placement in the continuous MHSU group, they were equally likely to be placed in the discontinued MHSU group. The non-comorbid MIS group was, however, more likely to be placed in the discontinued, rather than continuous MHSU outcome group. The non-comorbid group was at greater risk of placement in the discontinuous MHSU outcome category than the comorbidity group, but the differences were not statistically different (RRR=1.74, p=0.149, analyses not

shown). Neither non-comorbid MIS or MIS-physical comorbidity were associated with greater risk of placement in the initiated MHSU outcome group.

An inverse U-trend was observed in the associations between somatic symptom severity and initiated MHUS, such that those reporting moderate, but not high, somatic symptom severity were at increased risk of placement in the initiated MHSU outcome category, compared to low somatic symptom severity.

MIS at S2 was the strongest covariate of continuous and initiated MHSU, suggesting that MIS at S2 was a determinant of MHSU S2 uptake, irrespective of previous MHSU at S1. Low education was associated with lower relative risk of placement in all of the outcome categories, indicating that those holding low educational qualifications were at greater risk of not using services whether at S1 or at S2. Those of non-White ethnicity were also at lower relative risk of placement in the discontinued outcome category, suggesting that this group was more likely to have never used mental health services at any timepoint, rather than having started and discontinued MHSU.

Table 40 Fully-adjusted associations of comorbidity and continuity of mental health service use

| | **No MHSU (n=785)** | **Discontinued MHSU (n=99)** | | **S2 initiated MHSU (n=81)** | | **Continuous MHSU (n=87)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Comorbidity (S1)*** | | | | | | | |
| No identified illness | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.04 (2.19-7.44) | <0.001 | 0.65 (0.26-1.61) | 0.355 | 0.85 (0.31-2.32) | 0.754 |
| MIS-physical comorbidity | 1.00 | 2.30 (1.04-5.10) | 0.040 | 1.59 (0.72-3.49) | 0.250 | 2.90 (1.17-7.18) | 0.022 |
| ***Somatic symptom severity (S1)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 0.97 (0.52-1.81) | 0.916 | 2.60 (1.40-4.84) | 0.003 | 1.74 (0.84-3.61) | 0.134 |
| High | 1.00 | 1.35 (0.60-3.04) | 0.475 | 1.97 (0.84-4.62) | 0.118 | 1.21 (0.48-3.03) | 0.684 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 1.30 (0.72-2.34) | 0.381 | 0.67 (0.29-1.53) | 0.341 | 3.01 (1.50-6.00) | 0.002 |
| ***MIS (S2)*** | 1.00 | 1.84 (0.94-3.62) | 0.075 | 8.30 (4.53-15.23) | <0.001 | 7.83 (3.91-15.65) | <0.001 |
| ***Female (S1)*** | 1.00 | 1.55 (0.89-2.71) | 0.123 | 1.31 (0.74-2.31) | 0.347 | 0.90 (0.50-1.61) | 0.720 |
| ***Age (continuous) (S1)*** | 1.00 | 0.99 (0.97-1.01) | 0.166 | 1.00 (0.98-1.02) | 0.742 | 0.98 (0.96-1.00) | 0.079 |
| ***Non-White ethnicity (S1)*** | 1.00 | 0.57 (0.32-1.02) | 0.058 | 0.65 (0.33-1.30) | 0.225 | 0.61 (0.31-1.21) | 0.160 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.23 (0.60-2.54) | 0.574 | 1.31 (0.58-2.96) | 0.517 | 1.55 (0.72-3.31) | 0.260 |
| ≥10 years in the UK | 1.00 | 0.94 (0.47-1.86) | 0.849 | 1.87 (0.87-4.02) | 0.106 | 1.40 (0.67-2.93) | 0.371 |
| ***Education (S1+S2)*** | | | | | | | |
| No qualifications | 1.00 | 0.25 (0.07-0.96) | 0.043 | 0.28 (0.09-0.90) | 0.033 | 0.22 (0.08-0.62) | 0.004 |
| GCSE | 1.00 | 1.21 (0.59-2.45) | 0.604 | 0.40 (0.16-0.98) | 0.045 | 0.39 (0.14-1.07) | 0.068 |
| A-level | 1.00 | 1.10 (0.58-2.08) | 0.770 | 0.85 (0.44-1.63) | 0.614 | 0.69 (0.34-1.38) | 0.289 |
| Degree or above | | 1.00 | | 1.00 | | 1.00 | |
| ***Adverse employment conditions*** | 1.00 | 1.55 (0.82-2.91) | 0.175 | 1.69 (0.89-3.22) | 0.107 | 1.54 (0.84-2.80) | 0.159 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***(S1+S2)[a]*** | | | | | | | | |
| ***Benefits receipt (S1+S2)[b]*** | 1.00 | 0.84 (0.45-1.56) | 0.575 | 0.94 (0.48-1.82) | 0.851 | 1.43 (0.74-2.78) | | 0.290 |
| ***Social network size (S1)*** | | | | | | | | |
| 2 or less | | 1.00 | | 1.00 | | 1.00 | | |
| 3-4 | 1.00 | 0.44 (0.18-1.06) | 0.069 | 0.95 (0.29-3.13) | 0.929 | 1.11 | (0.39-3.17) | 0.843 |
| 5 or more | 1.00 | 0.73 (0.32-1.67) | 0.460 | 1.58 (0.47-5.33) | 0.459 | 1.48 | (0.49-4.47) | 0.488 |
| ***Stressful life events (S1+S2)*** | | | | | | | | |
| 0-2 | | 1.00 | | 1.00 | | 1.00 | | |
| 3-5 | 1.00 | 1.46 (0.69-3.12) | 0.324 | 0.86 (0.41-1.81) | 0.691 | 1.93 | (0.59-6.27) | 0.274 |
| 6 or more | 1.00 | 2.17 (0.97-4.86) | 0.060 | 0.76 (0.34-1.69) | 0.502 | 3.23 | (0.93-11.16) | 0.064 |

CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures

'No MHSU' (n=884) represents the reference category in the multinomial regression (not shown).

[a] Working aged (<65) persons moving or persistently out of employment or education between S1 and S2.

[b] Benefits are non-health related

## 4.9 Discussion

### 4.9.1 Summary of results

#### 4.9.1.1 Aim 2.1: Prevalence estimation

- In S1, 8.8% reported 12-month MHSU from primary care services only and 8.0% reported MHSU from secondary care sources. In S2, the corresponding prevalence estimates were 7.4% for primary MHSU only, and 7.0% for secondary MHSU.
- 3/4 of the sample did not use services at either timepoint. Service users were roughly evenly distributed across the other MHSU pattern outcomes: 8.4% reported continuous MHSU between S1 and S2, 7.7% reported initiated MHSU at S2, and 9.7% reported discontinued MHSU at S2.

#### 4.9.1.2 Aim 2.2: Associations between comorbidity and service use outcomes

H1:

- Cross-sectional associations between comorbidity and primary and secondary MHSU were observed. The comorbidity group was more likely report MHSU compared to the no MIS group, but not the non-comorbid MIS group, thus partially supporting hypothesis H1a.
- Prospective associations between comorbidity and primary and secondary MHSU were observed. The comorbidity group was more likely report MHSU compared to both the no MIS and the non-comorbid MIS group, supporting hypotheses H1b.
- The comorbidity group was more likely report continuous MHSU over time compared to both the no MIS and the non-comorbid MIS group, supporting hypotheses H1c.

H2:

- Compared to those reporting no MIS or non-comorbid MIS, neither unadjusted nor adjusted associations between comorbidity and secondary MHSU were stronger relative to associations between

comorbidity and primary MHSU, either cross-sectionally or prospectively. These results did not support hypothesis H2.

H3:

- In support of hypothesis H3, unadjusted associations between comorbidity and continuous MHSU were stronger relative to associations between comorbidity and discontinued MHSU, and comorbidity and initiated MHSU, compared to no MIS. However, there were no differences in the adjusted associations between comorbidity and the MHSU pattern outcomes compared to no MIS, contrary to the H3 hypothesis.
- Unadjusted and adjusted models indicated that compared to non-comorbid MIS, comorbidity was associated with greater risk of continuous MHSU, relative to discontinued MHSU, supporting the hypothesis. There were no differences in risk from non-comorbid MIS, relative to initiated MHSU.

H4:

- Contrary to hypothesis H4, quality indicators of mental health care in primary care were not significantly distributed by comorbidity.

#### 4.9.1.3 Aim 2.3: Associations between comorbidity and potential mediators

H5:

- In both the S1 and S2 samples, comorbidity was associated with poorer perceived health and functioning, compared to both no MIS and non-comorbid MIS, supporting hypothesis H5. Somatic symptom severity was particularly strongly associated with comorbidity.

#### 4.9.1.4 Aim 2.4: Associations between potential mediators and service use outcomes

H6:

- Those reporting poorer perceived health and functioning reported greater primary and secondary MHSU in S1 according to all indicators of perceived health and functioning. All but one indicator were also

associated with greater prospective primary and secondary MHSU in S2. Poorer perceived health and functioning were also strongly associated with continuous MHSU over time, according to all indicators. Thus, hypothesis H6 was supported.

#### 4.9.1.5 Aim 2.5: The mediating effect of perceived health and functioning in associations between comorbidity and mental health service use

H7:

- In support of hypothesis H7, somatic symptom severity and perceived functioning limitations mediated associations between comorbidity and MHSU, both at S1 and S2, while self-rated health and daily functioning problems did not. Specifically, somatic symptom severity mediated both the cross-sectional and prospective associations between comorbidity and primary MHSU. Perceived functioning limitations due to emotional health mediated the cross-sectional and prospective associations between comorbidity and both the primary and secondary MHSU outcomes. Perceived functioning limitations due to emotional health also mediated the association between comorbidity and continuous MHSU.

H8:

- Consistent with the H8 hypothesis, perceived functioning limitations due to emotional health remained associated with cross-sectional primary and secondary MHSU at S1, after accounting for other mediators and explanatory factors. Somatic symptom severity remained associated with primary MHSU in S1. In the adjusted prospective model, perceived functioning limitations remained associated with secondary MHSU at S2, while the association with primary MHSU at S2 was fully attenuated. In contrast, somatic symptom severity was associated with primary MHSU also at S2. Consistent with the H8 hypothesis, perceived functioning limitations mediated the association between comorbidity and continuous MHSU over time.

### 4.9.2 Prevalence of mental health service use contextualised

The results from analyses addressing aim 2.1 provide local estimates of MHSU in the community for two different timepoints. The prevalence estimates of MHSU in S1 and S2 were similar, although the estimates were consistently slightly lower in S2. These slight differences may be explained by "need", as CIS-R scores were slightly lower in S2 (24.2% (95% CI: 22.0-26.5) in S1; 23.1% (95% CI: 20.4-26.0) in S2).

#### 4.9.2.1 National context

Comparisons with the national literature suggest that the prevalence of MHSU overall and in primary care were similar, but that SELCoH respondents reported greater secondary MHSU, although directly comparable estimates were not available. The National Adult Psychiatric Morbidity Survey 2007 (APMS) used similar sampling methods and MHSU measures to those in SELCoH [53], and found that 11.1% [391] reported primary MHSU in the past year, compared to equivalent estimates of 12.7% and 10.1% in S1 and S2. In contrast, 3% and 2% of APMS respondents scoring above 12 on the CIS-R reported MHSU provided by a psychologist and psychiatrist, respectively, in the past year [53]. In SELCoH, services used from psychological therapist/counsellors and mental health specialists were estimated at over 5% and at 2.0% in the whole population and not just among those of CIS-R scores of 12 or higher. Also compared to the British Household Panel study, the overall 8.0% and 7.0% estimates of overall secondary MHSU in S1 and S2 were higher than equivalent national estimates: 2.1% of respondents in the British Household Panel study reported past-year use of services provided by a "psychotherapist" (including psychiatrist or analyst) [411]. Even if the questions were more inclusive in SELCoH, and the population estimates reflect differences in "need" [52], the discrepancy is noteworthy. Given that the South London and Maudsley NHS Foundation Trust serving the catchment area of SELCoH provides the most extensive range of mental health services in the UK [505], greater availability of services could potentially contribute to the elevated prevalence of secondary MHSU in SELCoH.

#### 4.9.2.2 International context

Comparisons with the international literature suggest that the SELCoH population made greater use of primary care services, as well as MHSU over time. Although international comparisons should be interpreted cautiously, relatively reliable comparisons can nevertheless be made to the European health service study ESEMeD and the Canadian Community Health Study (CCHS) 1.2, which used similar MHSU measures and produced a composite variable similar to that used in this chapter [412, 426]. In ESEMeD, the aggregated prevalence of mental health services in the general populations of six European countries (not including the UK) was 6.4% [362] and 8.7% in CCHS 1.2 [506]. These estimates were much lower compared to SELCoH's population estimates of 16.8% in S1 and 14.4% in S2. While need may partially explain the discrepancy, other factors are also likely to contribute to the differences.

Examination by service sector suggests that the discrepancies are primarily driven by greater uptake of primary care services by SELCoH respondents. Half of all service users SELCoH reported primary MHSU only, a quarter secondary MHSU only, and another quarter used of both. In ESEMeD and CCHS 1.2 service users were evenly distributed by these categories: a third reported primary MHSU only, a third secondary MHSU only, and the final third used both [362, 412]. Thus, a greater proportion of the SELCoH service users used primary care services, without using secondary services.

Further comparisons indicate that whilst overall primary MHSU may be more prevalent in SELCoH than in CCHS (12.7% in S1 and 10.1% in S2 vs 5.4% in CCHS [507]), the pattern is reversed when clinical need is taken into account. While 28.6% of those reporting MIS in SELCoH reported primary MHSU (analyses not shown), 38.4% of the Canadian general population sample with mental health problems used primary care services [507]. It would thus suggest that greater use of primary care services in SELCoH are explained, not by more persons in clinically defined "need" using services, but by greater use among those without such "need".

Ten Have et al. [370] conducted one of the few studies in a universal healthcare setting which adopted a comparable four-category variable approach in order to

examine MHSU patterns over time. Ten Have et al [370] made use health survey data collected at two timepoints from Dutch household members (Netherlands Mental Health Survey and Incidence Study, NEMESIS) in order to compare incident and continuous service users. A similar proportion of respondents were continuous service users in the SELCoH study and the Dutch cohort: 8.4% and 7.8% reported continuous MHSU in SELCoH and NEMESIS, respectively [370]. However, the estimates are not directly comparable as the indicator of MHSU in SELCoH was reported for the past 12 months at S1, whereas MHSU at the first timepoint in NEMESIS referred to MHSU during lifetime. Despite that MHSU referred to a much longer time-frame in NEMESIS, the prevalence of continuous was still higher in SELCoH. Thus, continuous MHSU in SELCoH could therefore plausibly be even higher in SELCoH if a comparable lifetime approach of continuous MHSU were to be adopted.

Taken together, the international comparisons suggest that community members in the SELCoH catchment area present to primary care services more often with complaints of sub-threshold clinical significance. Given the context of over-all greater social deprivation of the catchment area [437, 438], this may suggest that people present with complaints relating to burdens associated with social problems, which GP services are unable to adequately address, given that problems are not of clinical severity to warrant referrals to secondary services. In turn, without adequately addressing the problems, the persistence of these social burdens may contribute to the more persistent help-seeking patterns observed.

#### 4.9.2.3 Potential unmet mental health need in the community

While this chapter has been concerned with explaining the hypothesised amplified use of mental health services among those with mental-physical comorbidity, it is important acknowledge that more than half of those with significant psychiatric symptoms – with or without physical comorbidity – did not make use of services. These figures are consistent with both national and international research indicating that two thirds of those with mental health need do not receive potentially beneficial treatments for their problems [53, 363, 366, 508]. Informal care for mental health problems has been found to be common [381, 415], and some may find their needs met by alternative sources of care. However, even when considering informal care there is still likely to be a

substantial unmet need for mental health services in the community [381]. Recent media attention has been drawn to the significant critique directed towards the UK Department of Health for the failure to adequately prioritise mental health services, resulting in an inability of mental health services to cope with the demand for treatments [509–512]. Whilst evidence does suggests that many with mental illness symptoms remit spontaneously [361], evidence has also found that many help-seekers' mental health deteriorates whilst waiting for treatment [510]. A recent report from the UK showed that of those who tried to access talking therapies, 67% became more unwell, 40% caused harm to themselves, and one in six attempted suicide [510]. The characteristics of those who remit or deteriorate are likely to be patterned according to social statuses to the disadvantage of the vulnerable, but is as of yet an unexplored research question. There is thus scope for future work to expand on the analyses of the current chapter to examine whether non-service users reporting MIS experience potential barriers to care, or whether they chose not to use them due to sufficient support received from alternative sources, or because their symptoms are non-impairing. Recent qualitative research from SELCoH suggests that both may be true. Twenty-four respondents from SELCoH 1 who met the criteria for a CMD but did not report MHSU were re-contacted to be interviewed about reasons for not seeking help from services [513]. Barriers included negative expectations of services and fear of stigma, but many also reported that informal care was sufficient to address their problems [513]. Nevertheless, only 4 of 24 had resolved their mental health problems [513].

### 4.9.3 Mental health service use and comorbidity

#### 4.9.3.1 The amplifying effect of physical comorbidity on mental health service use

Overall, 31.2% of the non-comorbid MIS group made use of primary and/or secondary services in S1, and the equivalent estimate in the comorbidity group was 39.5%. The prevalence differences in MHSU between the non-comorbid and comorbid groups were not statistically significant in S1, but the differences in both primary and secondary MHSU increased sharply over time. By the second timepoint MHSU by the comorbidity group was more than double that of the non-comorbid group, driven by a drop in MHSU by the non-comorbid MIS group (15.8% of primary and/or secondary MHSU).

#### 4.9.3.1.1 The cross-sectional association between comorbidity and MHSU

The cross-sectional findings are broadly consistent with international research from the WHO World Mental Health Surveys, reporting that 37.6% of those with non-comorbid depression in developed countries reported past-year MHSU, compared to 42.9% among those reporting depression and one comorbid chronic physical condition, and 44.7% among those reporting depression and two or more physical conditions [427]. However, the SELCoH findings conflict with estimates from a large Australian population health survey, indicating no differences in MHSU between comorbid and non-comorbid mental illness groups [475].

After adjusting the cross-sectional associations for relevant potential mediators and explanatory factors, MIS regardless of physical comorbidity, was the strongest indicator associated with primary MHSU, and one of the strongest associated with secondary MHSU. Although the associations between comorbidity and MHSU were stronger than those of non-comorbid MIS and the S1 MHSU outcomes, the differences were not statistically different. These findings are consistent with adjusted cross-sectional findings from studies among persons with mental health problems which observed no impact of physical comorbidity on service use [389, 491] or depression identification by services [425]. The findings are inconsistent with other research indicating amplifying effects of physical comorbidity on MHSU among persons with mental health problems [434] and in population samples adjusting for mental health [363, 397, 412, 413, 421, 426], and yet other research indicating that comorbid physical illness inhibits MHSU among persons with mental health problems [432] and population samples adjusting for mental health [434]. The discrepancies may be explained by a greater burden of physical comorbidity in some samples, as research suggests an amplifying effect of two or more chronic conditions, but observe no differences when examining the impact of one condition [427]. Alternatively, smaller survey studies may be under-powered to detect differences, as studies using larger population surveys (N>36000) have found physical illness to be associated with small to modest increases in MHSU (20-80% increase in odds) for both primary and secondary MHSU in comprehensively adjusted models [397, 426].

#### 4.9.3.1.2 The prospective associations between comorbidity and MHSU

The prospective analyses investigating the impact of physical comorbidity over time in a community sample has contributed novel findings to the literature. Compared to the no MIS group, neither the non-comorbid nor the comorbidity groups were more likely to use services at follow-up, after making adjustments for explanatory factors and mediators. Contrasts between non-comorbid MIS and comorbidity nevertheless indicated that comorbidity was associated with over three times elevated relative risk of both primary and secondary MHSU. The adjusted analysis of the MHSU patterns also indicated that the comorbidity group was more likely to continuously use mental health services. This indicates that the results from the prospective analysis were not driven by new uptake of services, but rather persistent MHSU.

A comparable Dutch study examining MHSU patterns over time [370] did not examine comorbidity explicitly, but mental and physical health separately. Ten Have et al. [370] found that compared to no service use, CMDs and physical illness were associated with continuous MHSU in unadjusted analyses. In adjusted models, CMDs remained strong correlates of continuous MHSU while the association with somatic symptoms was fully attenuated. The findings from this chapter show that simultaneously considering the impact of mental and physical illness may have substantial effects on continuous MHSU.

While there are no other directly comparable studies examining the longitudinal impact of comorbidity on MHSU, the findings are broadly, in line with research indicating greater compliance with mental health treatments among those with physical comorbidities [416]. However, the findings are inconsistent with a prospective study by Nuyen et al. [424] of primary care patients newly diagnosed with depression by GPs. They found no overall difference in treatment initiation by physical comorbidities, but lower treatment initiation among persons with two specific physical conditions [424]. The inconsistencies may be explained by the fact that SELCoH identified symptoms of mental illness in the community, while Nuyen et al. [424] examined persons with identified depression in primary care.

#### 4.9.3.2 The mediating role of perceived health and functioning

The mediation analyses presented in this chapter were the first to test the mediating effect of perceived health and functioning in the association between mental-physical comorbidity and MHSU. Out of the hypothesised mediators, perceived functioning limitations due to emotional health and somatic symptom severity were the only variables that exerted mediating effects on the associations between comorbidity and MHSU. In contrast, the more global indicators of general health (self-rated health) and disability (daily functioning problems) did not mediate associations with MHSU.

##### 4.9.3.2.1 The mediating role of perceived functioning limitations

Perceived functioning limitations due to emotional health were hypothesised to explain the association between comorbidity and MHSU more so than the other indicators of perceived health and functioning, given that the measure captured an attribution of impairments to mental health. It was thus anticipated that this would tap into perceptions of need for mental health services, and thus amplify MHSU. The results supported this hypothesis as these perceived functioning limitations, mediated associations between comorbidity and both primary and secondary MHSU at both timepoints, as well as the association with prospective MHSU. In the fully-adjusted models, they also remained associated with nearly all MHSU outcomes of interest. The fact that perceived functioning limitations were particularly strongly and consistently associated with secondary MHSU, rather than primary MHSU only, suggests that these may be indicators of special clinical significance which, in the NHS gatekeeping system, warrant access to secondary mental health services. The analyses may also suggest that perceived functioning limitations are important indicators of clinical severity, since measures of these limitations at baseline were prospectively associated with nearly two-fold increase in relative risk of secondary MHSU, independently of MIS at both timepoints, and explanatory factors. The fact that they were associated with a three-fold increase in risk of continuous MHSU suggests that despite receiving treatment, those reporting these limitations are unlikely to stop using services. This may indicate that they are less likely to benefit from services provided, and could thus be worth prioritising for targeted interventions.

#### 4.9.3.2.2 The mediating role of somatic symptom severity

The fact that somatic symptoms specifically mediated the association between comorbidity and primary MHSU could be explained in a number of ways. Greater somatic symptom severity may result in more frequent visits to the GP. As a result, the opportunity to discuss mental health may arise more frequently, and result in greater reported primary MHSU in the survey. More frequent GP visits have indeed been found to be associated greater likelihood of depression diagnosis [425].

Somatic symptoms did not only attenuate the association between comorbidity and primary MHSU, but also mediated the association between non-comorbid MIS and primary MHSU. This finding is consistent with evidence indicating that many with psychiatric illness present to their GPs with physical symptoms [514]. This may suggest that the presence of somatic symptoms generate feelings of legitimate help-seeking. Perceptions of GP being associated with physical health may cause those experiencing somatic symptoms to feel more entitled to seeking help from health professionals, than those with mental health problems without somatic symptoms. The inverse U-shape observed in prospective analyses could indicate that moderate somatic symptoms may be likely to be attributed to mental health and facilitate help-seeking, while severe somatic symptoms might be more likely to be attributed to physical health.

The fact that somatic symptoms were associated with primary MHSU specifically may represent a potential bottle-neck in the NHS primary care gatekeeping system. While the perception of somatic symptoms may increase help-seeking behaviour, reflected in greater use of more accessible primary care services, gatekeeping GPs may be more reluctant to refer persons presenting with somatic complaints to secondary mental health services, even though it might benefit them.

Alternatively, somatic symptoms may place an increased burden on persons with comorbidity, leading to more severe mental illness and in turn greater MHSU. Although no clinical severity measure was used, it is unlikely that psychiatric severity drives the association with primary MHSU, given that psychiatric severity is one of the most important determinants of secondary MHSU [367, 494]. Associations would thus also be observed with secondary MHSU.

### 4.9.4 Determinants of mental health service use

Perceived health and functioning were not the only important determinants of MHSU in this study, but socio-demographic, socio-economic, social factors also played a significant role. Interpretations of these findings are discussed in sections below.

#### 4.9.4.1 Socio-demographic factors

At both timepoints, ethnic minorities were less likely to report use of secondary mental health services, particularly among Black minority groups. Given that psychological therapist/counsellors were the most common type of secondary service reported, this finding suggests that inequities in secondary MHSU by ethnic groups concern talking therapy treatments in South East London. This is inconsistent with research indicating equitable use of psychological therapy by ethnicity in Southwark [515], but consistent with UK research observing inequitable use of talking therapy treatment by Black minority groups [392]. However, no differences were observed in primary MHSU which is inconsistent with UK research indicating that non-White ethnic groups are also less likely to use GP services for mental health problems [372, 391].

That ethnic inequities were specific for secondary MHSU could suggest that there are structural or interpersonal barriers to care for ethnic minority groups. This interpretation consistent with previous UK and US research illustrating diverging service use patterns for ethnic minorities with regards to pathways into care [516, 517]. Compared to those of White ethnicity, Black ethnic groups are more likely to come into contact with services though more adverse pathways (e.g. compulsory hospital admission), and be in contact with community outreach teams [392–394, 518–520]. Black minority groups are also more likely to rely on informal support [518, 521]. Perceived barriers to care, lack of perceived need, anticipated discrimination and negative past experiences in healthcare may be contributing factors to the lower uptake secondary mental health services among Black minority groups [393–395].

There were no differences in cross-sectional MHSU by migrant status. However, at follow-up a robust two-fold increase in MHSU was associated with migrant status, irrespective of length of UK residence. The finding that the elevated MHSU were driven by migrants of White ethnicity is consistent with

findings from Gazard et al. [258], observing greater perceived functioning limitations due to emotional health only among White migrants in SELCoH. Whilst the analyses in this chapter controlled for perceived functioning limitations as well as MIS, there may be other factors driving the association among migrants at S2. For example, the S2 analyses adjusted for CMDs and self-reported mental illness, but did not control for psychotic symptoms, substance misuse or any other psychiatric disorders. The adverse socio-economic climate in the aftermath of the recession may have affected migrants more significantly, and may explain why differences were observed in S2, but not S1.

#### 4.9.4.2 Socio-economic factors

Of the indicators of socio-economic disadvantage, low education is most consistently associated with lower MHSU in the literature, and is associated with low secondary MHSU in particular [362, 368, 391, 397, 409, 493, 522, 523]. While no differences in education were observed in S1, inequities by education emerged at S2, and the MHSU patterns analyses indicated that those reporting no qualifications were more likely to report no MHSU at both timepoints, than MHSU at either timepoint or both. Since low education was associated with lower use of both primary and secondary services in S2, this might suggest that barriers to services relate to help-seeking, rather than structural or institutional barriers and lack of referrals. Indeed, evidence suggests that lower education groups are more likely to report acceptability barriers to mental health care [507]. The most commonly cited acceptability barriers to services in a Canadian general population study by Steele et al. [507] were 1) preferences to manage problems themselves, 2) not getting around to or not bothering, and 3) not knowing where to get help from. This suggests that mental health literacy may be particular problems associated with lower education groups, which may be important to address in order to ensure equitable access of mental health services.

While the other socio-economic indicators (employment status, low household income, debt and benefits receipt) were associated with greater MHSU in unadjusted analyses, none of these remained associated after adjusting for comorbidity and other factors. This suggests that these associations were largely driven by mental health service need, in terms of psychiatric comorbidity.

#### 4.9.4.3 Social factors

Cross-sectional analyses suggested that small social networks were associated with greater uptake of services; consistent with research indicating that those with larger social network perceive less need for MHSU, and with findings showing that informal support alleviates distress and may offset MHSU [414, 491, 524]. The finding that perceived social support was not associated with mental health services was inconsistent with literature [525]. It is possible that some support given in the SELCoH sample facilitated MHSU, while other support may have inhibited it, thus causing a net effect of no association. Research suggests that the nature and quality of support, in terms of types of advice and support given, is more relevant for service use, rather than the availability of support per se [369].

The finding that psychosocial resources were not prospectively associated with MHSU, or associated with patterns of MHSU over time, may be the consequence of psychosocial resources not being measured at follow-up. This is a limitation with the current study, especially in the light of evidence suggesting that experiences of using mental health services affects the structure of social networks [526].

Increasing numbers of stressful events during lifetime were associated with greater MHSU in S1 independently of psychiatric morbidity. These findings add to a rather limited number of studies suggesting that stressful life events are important determinants of MHSU [488, 527–529]. However, stressful life events were not associated with prospective MHSU or MHSU patterns over time. These findings are consistent with US evidence suggesting that adverse events made no contribution to continuous formal treatment use over six months among elderly community-dwelling adults [369]. However, comparisons should be made with caution given that the samples and healthcare contexts were very different.

#### 4.9.4.4 Attitudinal factors

This is the first study to test attitudes towards mental health services in relation to comorbidity and MHSU. The results indicated that the attitudes measured in SELCoH played no role in explaining the association. This is inconsistent with literature indicating that attitudes and perceptions of treatment effectiveness

influence uptake of mental health services [378, 495, 530, 531]. However, an important limitation of these analyses presented in this chapter was that the attitudinal factors were only measured in S2 after MHSU inS1 and S2 had already taken place. Thus, they are more likely to reflect experiences of previous MHSU, and may be more powerful determinants of MHSU when measured prospectively.

### 4.9.5 Potential explanations of the amplifying impact of comorbidity on mental health service use

While those reporting MIS with and without physical comorbidity were initially no different in MHSU, two years on, the comorbidity group was over three times more likely to use services compared to the non-comorbid MIS group. Three explanations of these findings will be considered: 1) differences in barriers/ facilitating factors 2) unaccounted differences in mental health need, and 3) differences in benefit from mental health treatment.

#### 4.9.5.1 Differences in barriers or facilitating factors

In a time when mental health services are stretched, it is important to ensure that service use is equitable; or in other words, that there is equal use for equal need [532]. To this end, the differences in MHSU by physical comorbidity status may represent inequities to the disadvantage of those of non-comorbid MHSU. It could therefore be important to consider potential barriers to continuous MHSU among those of non-comorbid MIS, and potential facilitating factors among those reporting physical comorbidity. Given that differences by physical comorbidity status were not found in cross-sectional analyses, but emerged over time, this might suggests that access barriers are limited. However, more regular interactions with healthcare providers may lead to greater continuity of care among those with physical comorbidity. This may in turn facilitate the continuity of MHSU, or treatment adherence, while non-comorbid groups are more likely to discontinue MHSU. This explanation is supported by research indicating greater adherence to psychological interventions among those with physical comorbidities [416].

#### 4.9.5.2 Differences in unmeasured need

An alternative explanation to the observed differences in continuity of MHSU by comorbidity is that they are driven by unmeasured need, and therefore not

inequitable. Whilst the analyses adjusted for MIS both at baseline and at follow-up, there was no measure of mental illness severity. Studies have documented associations between psychiatric severity, complexity, and persistence with chronic physical conditions [491, 533, 534]. In addition, the added complexity of a physical condition may present additional difficulties in treating mental health problems in this service group more effectively. Thus, greater continuity of MHSU by those with comorbidities may reflect differences in need, driven by greater symptom severity and psychiatric complexity demanding longer time from mental health services to resolve.

#### 4.9.5.3 Differences in benefit from treatment

A final explanation of why those with comorbidities may make greater use of mental health services over time may relate to different benefits gained from services, even when need is equal. There are two main ways in which those with comorbidities may gain less from services than non-comorbid counterparts, namely differences in quality of care, and differences in the capacity to benefit from services.

##### 4.9.5.3.1 Inequities in quality of care

Quality of mental health care is an aspect of mental health services, which simple utilisation measures do not capture and could plausibly vary by physical comorbidity status. In this study, there was no indication that those reporting mental-physical comorbidity were registered with practices providing neither better nor worse mental health care than those reporting non-comorbid MIS or those reporting no MIS. This was driven by an assumption that the greater socio-economic disadvantage experienced by those reporting mental-physical comorbidity, would mean that those with comorbidities would also live in more deprived areas, which in turn could influence their availability to high quality care. The high level of integration between high and low deprivation areas in the urban catchment area may facilitate access to high quality services for those who living in more disadvantaged areas, and may explain why no differences were observed.

However, these analyses were limited by the fact that quality measures were only available at the practice level, and not at the individual level. It is therefore possible that individual quality of mental health care may nevertheless

systematically vary by comorbidity status. If the quality of mental health care is indeed worse for persons with physical comorbidities, ineffective treatment may cause persons with comorbidity to stay longer in care in order to benefit from services, while those with non-comorbid mental illness make prompter recoveries and exit services.

#### 4.9.5.3.2 Compromised capacity to benefit

Even if need and quality are equal, there are still reasons why the comorbidity group may benefit less from mental health services. In the same way that the fundamental social cause theory reasons that resources facilitate the ability to make use of services [18], they may equally influence the capacity to benefit from services. Although socio-economic resources were accounted for, those with mental-physical comorbidity may lack more covert resources of social and psychological nature, which may not have been captured in this study. The lack of these resources could compromise capacity to benefit from services in the way that persons with non-comorbid MIS do.

Detweiler-Bedell et al. [142] presented a self-regulatory framework explaining why those with depression and physical comorbidities may be less likely to benefit from mental health services. The authors make special reference to the lack of integration between mental and physical healthcare, where specialist clinicians without a comprehensive understanding of managing mental-physical comorbidity may provide conflicting treatment instructions. Detweiler-Bedell et al. [142], further propose that the conflicting demands in managing mental and physical illness may force patients to make ill-informed health prioritisations, where physical health threats may often be perceived as more pertinent than mental health problems. This may inhibit persons to fully engage with the mental health treatments and gain optimal benefits from them.

Further, the burden of managing comorbidity does not only place a significant burden on the individual sufferer, but also on social support networks [535]. The support that is demanded from persons in the social network among persons with mental health problems, may be more quickly eroded in the context of a chronic physical health problem [142]. Given that social support plays an important role in recovering from mental illness [536], this erosion of social support could play a significant role in benefitting from services. Since social networks and perceptions of social support were not measured in S2, the

potentially important erosion of psychosocial resources may not have been captured.

In considering the implications of intersectionality [255], it is also possible that vulnerable social statuses combine to jointly undermine the capacity to benefit from services. Future research could explore whether among those with mental health problems; comorbid physical health interacts with vulnerable social statuses, such that fewer gains from interactions with services are observed with increasing numbers of vulnerable statuses.

### 4.9.6 Strengths and limitations

While prevalence estimates of MHSU were broadly consistent with other population surveys, research using linked datasets in Canadian populations suggests that health surveys underestimate MHSU among those reporting mental health problems [537, 538]. A cross-national European study also found that in surveys framing questions concerning MHSU as in SELCoH, utilisation was less likely to be disclosed compared to surveys asking about MHSU in relation to mental illness symptoms and diagnoses [539]. These studies also observed that that underreporting varied by mental health and social statuses [537–539]. If these types of underreporting also apply to England and London, and systematically vary by comorbidity or social statuses in SELCoH, this could affect the interpretations made in this chapter. However, methods used in the SELCoH survey were similar to those used in other population surveys, implying that the results were nevertheless comparable to the literature.

While the analyses in this study considered a comprehensive number of explanatory factors, there are potentially other important factors which were not possible to explore. These include psychological factors such as locus of control [417], personality characteristics such as neuroticism [379, 528, 540] as well as psycho-motivational factors such as desire for change [416]. In addition, perceived need which has been found to be among the most important determinants service use [384], was not possible to test in these analyses. Psychiatric severity such as psychiatric comorbidity or symptom burden was another important explanatory factor which was not included.

Quality was not examined at the individual level, and whether there are variations in mental health care quality by comorbidity therefore remains

inconclusive. However, individual level indicators of care are difficult to obtain in representative population samples, and given patients often see several different doctors may be difficult to interpret. Future research could apply record linkage methods, linking survey and primary care data to overcome the limitations with these analyses.

Further, analyses exploring patterns of MHSU simply illustrate how utilisation changes over time, but provide no insight into why MHSU was continued, discontinued MHSU or never initiated. Non-initiated or discontinued MHSU may occur for a host of reasons including non-impairing symptoms, mental health recovery, use of alternative services or support, as well as negative experiences with services. Understanding of reasons for use and non-use could be important in order to provide a richer understanding of the service use patterns, and identify potential barriers to target for intervention. Qualitative research would most appropriate to explore these research questions.

Finally, MHSU was measured as any use over the past year. This meant that quantity of MHSU and fluctuations in MHSU within the time-intervals of approximately two years between the surveys were not captured in these analyses. Considering these more nuanced aspects of MHSU may have revealed more distinct differences between non-comorbid and comorbidity groups, with respect to utilisation and MHSU continuity.

Notwithstanding the limitations outlined above, this study and makes novel contributions to the conflicting findings in the literature. It is the first to longitudinally consider the impact of comorbidity on MHSU, and has illustrated the importance of doing so. The analyses presented here are also the first to test the mediating effect of perceived health and functioning in the association between comorbidity and MHSU. Furthermore, the findings from this chapter have provided locally relevant information regarding factors associated with MHSU in South East London, and highlighted the possibility of important inequities by ethnicity and education.

### 4.9.7 Conclusion

Substantial differences between comorbidity and non-comorbidity emerged over time, whilst none were found in cross-sectional analyses, suggesting that previous cross-sectional studies may have under-estimated the impact of

physical comorbidities on mental health services. The results therefore show that separately examining non-comorbid MIS and MIS-physical comorbidity constitutes a meaningful distinction with respect to MHSU. While MHSU research to date has commonly considered physical illness as an indicator of increased “need”, studies rarely distinguish between non-comorbid mental illness and mental-physical comorbidity. Instead the explicit impact of other “need” indicators such as psychiatric diagnoses or symptom severity had frequently been examined. These analyses show that chronic physical illness may be an indicator of severity that is important to consider in MHSU. The results also pointed towards a particularly important role of perceived functioning limitations, especially with regards to continuity of use, suggesting that these may partially mediate the impact of comorbidity on MHSU.

Differences in barriers or facilitating factors, psychiatric severity, or benefits from services are all potential explanations for why comorbidity is associated with greater persistence of MHSU. In the light of the findings from Chapter 3, the greater socio-economic disadvantage of those with mental-physical comorbidities may mean that the latter explanation may be particularly relevant to explore. Future research could therefore examine whether there are differences in mental health care quality by comorbidity, and whether those with comorbidities lack specific social and psychological resources which undermine the capacity to benefit from services. Detriments to social functioning may be particularly relevant to those with mental-physical comorbidity, and may play a significant role in the erosion of social resources over time. The next chapter will contribute to addressing this question, by examining the impact of comorbidity on trajectories of social functioning over time.

# Chapter 5 The impact of mental-physical comorbidity on social functioning

## 5.1 Chapter summary

This chapter addresses the third aim of the thesis: “to describe the trajectories of social functioning by comorbidity”. It was hypothesised that mental-physical comorbidity would be associated with greater risk of persistently poor social functioning, relative to continuously good functioning, compared to those without mental illness symptoms (MIS) and those with non-comorbid MIS. This hypothesis was tested longitudinally, examining comorbidity at baseline and employment trajectories and perceived social functioning over two timepoints.

Unadjusted results supported the hypothesis. Forty percent of those of working age with mental-physical comorbidity were persistently out of employment. A similar proportion reported persistently poor perceived social functioning. These figures were substantially higher compared to the non-comorbid and no MIS groups. However, there was limited support for the hypothesis after analyses accounted for explanatory factors. The comorbidity group was no different from the non-comorbid and no MIS groups in terms of persistent non-employment. Compared to the no MIS group, the non-comorbid MIS and MIS-physical comorbidity groups were at elevated risk of persistently poor social functioning but the groups did not differ from each other. Poor perceived health and functioning explained the elevated associations between comorbidity and non-employment, and accounted for the largest attenuation in associations between comorbidity and poor social functioning.

The fact that MIS (with and without physical comorbidity) were associated with persistently poor social functioning points towards a potentially “scarring” effect of mental illness on functioning. However, whilst MIS at follow-up were accounted for, measures of chronicity and severity were not and may also play some role in explaining the association between MIS at baseline and residual functioning impairment at follow-up.

## 5.2 Introduction

Social functioning refers to the ability to establish and maintain social relationships and social roles, as well as successfully undertaking work and leisure activities [541–543]. As such, systematic differences in social functioning are potentially indicative of systematic social exclusion, and are therefore a matter of social justice [544]. Moreover, impaired occupational functioning due to poor health incurs substantial financial costs to society in terms of lost tax revenue, and payments of disability benefits and early pensions [545]. Mental illness is particularly costly in this respect [545], and improving employment among persons with mental health problems has thus been raised a key priority in the Chief Medical Officer's latest annual report [95]. Evidence also suggests that physical health contribute to impairment of social functioning [546].

Social functioning constitutes a core component of the multidimensional concept of quality of life, alongside physical and emotional functioning [86, 547, 548], all of which are separate, but inter-dependent constructs [86]. External circumstances (e.g. employment) as well as subjective measures of social functioning (e.g. perceived role impairment) make important contributions to overall quality of life [549]. Although closely related, objective and subjective measures of social functioning do not necessarily correlate [549, 550]. Further, employment provides a more objective indication of societal participation and costs, but also financial costs to the individual given that employment constitutes the most important source of income [289]. In contrast, perceptions of functioning provide a subjective indication of life satisfaction and wellbeing, which are important values in themselves, but also key goals of UK public health [551]. In order to gain a comprehensive understanding of social functioning outcomes of comorbidity, I will examine longitudinal trajectories of both employment and perceptions of social functioning.

### 5.2.1 The impact of comorbidity on employment

Employment and health reciprocally influence one another [552]. An extensive body of literature has documented the negative mental health consequences of job loss and unemployment, and the positive effects of entering employment and remaining in employment [553–555]. Research also indicates that

employment has similar effects on physical health, although the evidence is sparser and more inconsistent [318, 553, 555, 556]. There is also evidence that health affects educational attainment [284, 557]. However, given that education is established in early life and constitutes one of the most important and stable socio-economic determinants of health [284], employment trajectories are more relevant for in order to examine the effects of cumulative disadvantage for the purposes of this thesis and will be the focus of the literature reviewed below.

Although less extensively researched, there is also strong evidence of “health selection” effects such that healthy people are more likely to enter and maintain employment [558, 559]. In contrast, mental and physical illness is associated with difficulties in entering employment, as well as exits from employment into unemployment and long-term sick leave [560]. Poor mental health is also associated with barriers to entering and re-entering employment [87, 561], and similar effects have been observed for physical health [556, 562]. Poor mental and physical health is also a risk factor of poor work productivity, short-term sick leave, as well as exiting employment [563–566]. Some evidence suggests that these health-selection effects are stronger for mental health. For example, mental illness has been found to be associated with a substantially greater number of disability days than somatic illnesses [567]. Similarly, re-employment among a general population sample of unemployed persons found no association between chronic physical illnesses and re-employment, but a strong association between mental illness symptoms and non-re-employment [561]. However, a recent meta-analysis of health selection effects on employment found that mental health problems and chronic physical conditions were associated with increased risk of disability pension and unemployment with similar effect sizes [560].

It is likely that the added burden of physical comorbidity compounds the effect of mental ill health on entering, maintaining and exiting employment. However, most studies tend to separately examine the impact of mental and physical health on employment trajectories, and limited research explicitly examines the effect of mental-physical comorbidity on employment transitions. The research that does often focus on specific patient groups (e.g. patients with schizophrenia [87]) or particular non-employed groups (e.g. disability benefit recipients [568]). Thus, the population impact of comorbidity on employment

may be underestimated in these research designs. This is especially relevant given that Chapter 4 indicated that over half of those with mental-physical comorbidities did not use mental health services.

There are nevertheless a number of cross-sectional general population studies indicating an important role of comorbidity. For example, a study using a US general population sample examined the impact of mental and physical health conditions on self-reported inability to work or carry out other usual activities. The associations between individual mental and physical conditions were substantially attenuated after controlling for comorbidity [569]. Similarly, a large cross-sectional study of the older working age population in Australia found that the risk of non-participation in the labour force markedly increased with the number multiple chronic illnesses (including mental disorders) [570]. These studies indicate that examining the impact of mental and chronic physical conditions without considering the impact of comorbidity significantly underestimates the impact of health on work outcomes. However, these studies did not separately examine the impact of mental-physical comorbidity, but accounted for multiple physical conditions as well as mental health disorders for all conditions. Thus, the specific impact of mental-physical comorbidity cannot be gauged from these types of studies.

A number of studies have explicitly examined the impact of comorbidity on employment trajectories. Kessler et al. [90] found that among persons aged 15-54 in the US general population, mental illnesses fully accounted for role impairments among persons with chronic physical conditions. Furthermore, a large cross-sectional study of the Australian general population found that comorbid depression and cardiovascular disease (CVD) were less likely to be in employment compared to both non-comorbid depression and non-comorbid CVD [571]. The results from a large Canadian population sample examining work absence among those in employment support these findings with respect to cardiovascular disease [492]. While non-comorbid depression and heart disease were respectively associated with 3- and 2-fold increases in risk of work absence, the impact of comorbid depression and heart disease was six-fold [492]. However, this pattern was not observed for the other five physical health conditions studied, while non-comorbid depression was associated with a 2-fold increase in odds of work absence compared to those without depression or the

specific physical condition examined [492]. Mental-physical comorbidity was also associated with greater odds of work absence, but the effect sizes were similar or weaker than those of non-comorbid depression. This supports evidence indicating that mental illness plays a particularly significant role in work outcomes, but suggests that the impact of physical comorbidity outside cardiovascular disease is limited. However, conflicting evidence from a cross-sectional study of the Dutch population found that non-comorbid mental disorders and a wide range of non-comorbid physical illnesses were associated with work impairment days [36]. Further, the impact of comorbid mental-physical illness was greater than the effects of either of the non-comorbid conditions [36].

Thus, whilst some evidence suggests that mental-physical comorbidity is associated with more adverse employment trajectories than non-comorbid illness, the research from general population studies to date is limited, inconsistent, and restricted to cross-sectional analyses.

### 5.2.2 Perceived social functioning

Abundant research has documented decrements in perceived social functioning (PSF) among those with mental disorders [572, 573] and among those with chronic physical conditions [546]. The literature suggests that mental health, rather than physical health, is particularly closely associated with PSF [86, 574–576]. For example, comorbid mental illness among those with chronic physical illness leads to substantial deterioration in PSF [577]. In contrast, results from a longitudinal study of Dutch community members and patients found that accounting for physical comorbidity caused only slightly attenuated associations between anxiety and PSF [85]. In support of these findings, a longitudinal study of the Dutch population among depressed patients observed no association between physical illnesses and future PSF [84]. Furthermore, Simon et al. [83] studied trajectories of PSF of patients with depression over six months, comparing groups with and without comorbid chronic physical illness. This study indicated that there were no differences in PSF between groups comorbid physical illness and the non-comorbid depressed group [83]. In contrast, physical illness was associated with substantial decrements in physical functioning. Over time, these physical limitations remained unchanged, but PSF improved as clinical outcomes of depression improved [83]. This points towards

a particularly important role of mental health in PSF, as opposed to physical health [83, 578].

Further supporting evidence comes from a prospective US study where patients with depression were contrasted against patients with chronic physical illnesses [575]. Both groups improved over time, but the depressed group was associated with poorer functioning at both timepoints [575]. The analysis adjusted for multiple chronic physical conditions, suggesting that depression drove this finding.

These studies suggest that mental health is more central to PSF than physical health, and that the impact of physical comorbidity may be negligible. However, conflicting research suggests that physical comorbidity significantly impact on PSF among those with mental illnesses, especially among elderly [567, 579].

Whilst health constitutes an important determinant of both employment and PSF trajectories, other factors also impact on these outcomes. For example, a longitudinal study of employment trajectories through times of economic recession and recovery in the UK found that social class modified the impact of longstanding physical illness on employment. Employment among men with longstanding illness in the highest social class dropped from 85% to 75% during the period of economic change, while employment dropped from 70% to 40% among men with longstanding illness in the lowest social class. In contrast, a study examining the effects of prolonged financial hardship found that prolonged financial hardship was not associated with PSF measured as social isolation, and that adjusting got physical illnesses did not substantially influence the associations [580]. The same study indicated that sustained financial hardship was strongly associated with physical functioning and cognitive functioning and depressive symptoms and that adjusting for physical illnesses did not attenuate these associations [580]. These findings suggest that social resources may play an important role employment trajectories, but less so in terms of other forms of social participation.

In summary, evidence suggests that the implications of mental health for occupational functioning are greater than physical health [581], but the explicit additional burden of comorbidity has not been explored prospectively in populations samples. Furthermore, research indicates that mental health is more closely associated with PSF, and that mental comorbidity possibly

accounts for role impairments of chronic physical conditions [90]. This may suggest that the added impact of physical comorbidity is negligible, but conflicting research suggests otherwise. This chapter will address these research questions by examining the added impact of physical comorbidity to poor mental health on social functioning trajectories over time.

### 5.2.3 Aim

In this chapter I address the third and final overarching aim of the thesis: “to describe the trajectories of social functioning by comorbidity”. Informed by literature documenting the continuous burden of comorbidity the following hypothesis was formed.

H) Compared to no MIS and non-comorbid MIS, comorbidity is associated with greater risk of persistently poor social functioning, relative to continuously good functioning

Employment/education trajectories were used as a more objective indicator of social functioning, while PSF trajectories represented a subjective indicator of social functioning. Unadjusted and adjusted multinomial regression models tested associations between comorbidity and trajectories of employment and PSF (Figure 29 and Figure 30). Explanatory factors considered for inclusion in the adjusted model of employment/education trajectories were socio-demographics, health-related and social factors. Socio-economic indicators were not included due to conceptual overlap with the outcome. In contrast, adjusted models testing associations between comorbidity and PSF included socio-demographic, social, health-related as well as socio-economic indicators as explanatory factors.

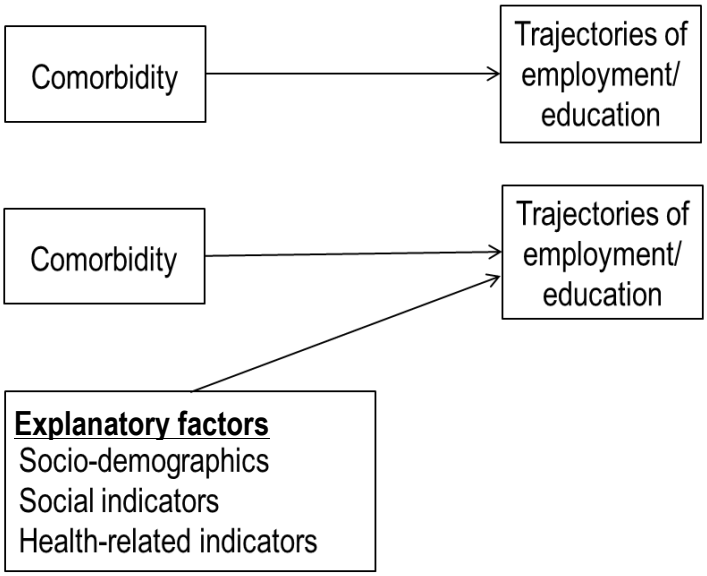



Figure 29 Unadjusted and adjusted models tested in Chapter 5: employment/education trajectories

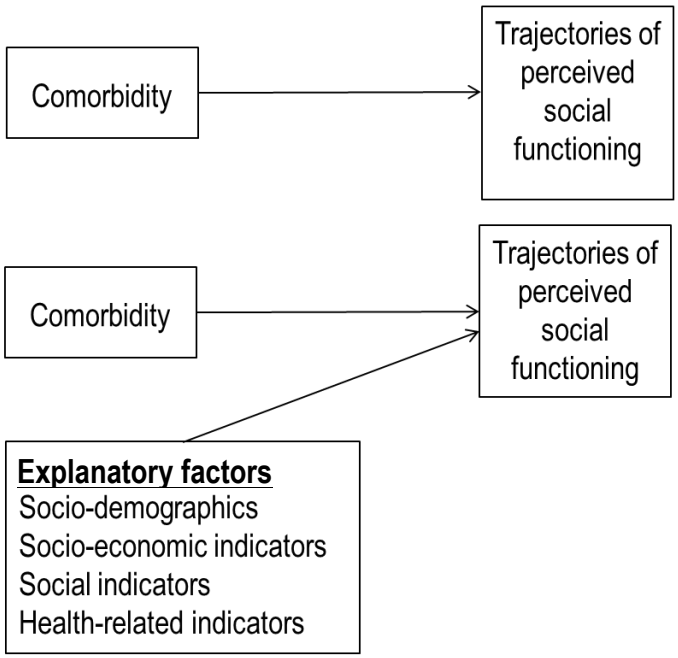



Figure 30 Unadjusted and adjusted models tested: PSF trajectories

## 5.3 Methods

### 5.3.1 Sample

The analyses made use of the S2 sample (N=1052). In line with previous research examining the impact of health on employment trajectories [451–454], the analyses of the employment/education trajectory variable were restricted to

those of working age (16-65 years; N=918). The analyses of the PSF outcome made use of the full S2 sample.

### 5.3.2 Measures

#### 5.3.2.1 Social functioning outcomes

##### 5.3.2.1.1 Employment/education trajectories

Measures of employment at S1 and S2 were cross-tabulated to generate a variable of employment/education trajectories with four categories: 1) stable employment/education, 2) transitions into employment/education, 3) transitions out of employment/education, and 4) persistently out of employment/education. “In employment/education” included those in employment (full-time employed, part-time employed, casual work, working students, or on temporary sick leave) and non-working students. “Out of employment/education” included those who were unemployed, permanently sick/disabled, in caring roles, or reported early retirement. The variable was restricted to persons of working age, excluding persons older than 65 at the time of the S2 survey (for details see section 2.6.1.2.1).

##### 5.3.2.1.2 Trajectories of perceived social functioning

A single item from the SF-12 measured PSF on a six-point scale [460, 461]. The item asked about the extent to which physical or mental health had interfered with social activities in the past four weeks, with responses ranging from “none of the time” to “all of the time”. The measures from S1 and S2 were made binary and cross-tabulated, producing a four-categorical variable of PSF trajectories: 1) good : good, 2) poor : good, 3) good : poor, and 4) poor : poor (see 2.7.2).

### 5.3.3 Independent variables

#### 5.3.3.1 Comorbidity (S1)

Mental-physical comorbidity was the main independent variable of interest. In keeping with the aim of understanding the added impact of physical illness on mental illness, the analyses made use of the 3-categorical comorbidity variable, used in Chapter 4 (see 4.2.1.2.1). The categories were: 1) no MIS (no identified illness or non-comorbid physical illness), 2) non-comorbid MIS, and 3) MIS-

physical comorbidity. Measures of mental and physical health at S1 contributed to this derived variable (see 2.3.4.6).

#### 5.3.3.2 Explanatory factors

##### 5.3.3.2.1 Socio-demographic measures

Socio-demographic factors included gender, age, relationship status, ethnicity and migrant status, measured in S1 (see 2.5). In unadjusted analyses the variables had the same categorisations as in Chapter 3 (3.2.2.2.1) and in the analyses addressing aims 2.3 and 2.4 in Chapter 4 (4.2.1.2.3) (Figure 31). In the interest of maintaining model stability, age and ethnicity were used differently in the multivariate analyses. Age was used as a continuous measure in block-adjusted as well as fully-adjusted analyses, and the binary ethnicity variable (White vs. Non-White: Black Caribbean, Black African, Other ethnicity) was used in fully-adjusted models.

**Socio-demographic measures**

**Gender (S1)**
- Male
- Female

**Age (S1)**
- 16-29
- 30-39
- 40-49
- 50-59
- 60 or over

**Relationship status (S1)**
- Married/cohabitating
- Single
- Previously in relationship

**Ethnicity (S1)**
- White
- Black Caribbean
- Black African
- Other

**Migrant (S1)**
- UK born
- <10 years in the UK
- ≥10 years in the UK

Figure 31 Socio-demographic measures used in Chapter 5

#### 5.3.3.2.2 Socio-economic measures

The SES variables included the highest level of reported education (S1+S2), adverse employment conditions (S1+S2), low household income (S1+S2), chronic debt (S1+S2) and benefits receipt (S1+S2) (Figure 32). Adverse employment conditions (S1+S2) was produced by collapsing categories of the employment/education trajectory variable, outlined above (section 5.2.2.1.1). Adverse employment conditions included transitions out of employment/education at S1 into unemployment, permanent sickness/disability, carer roles, or early retirement (age <65) at S2, as well as continuous non-participation in work or education between S1 and S2 (unemployment, permanent sickness/disability, carer roles, or early retirement). A binary variable of low household income grouped those who reported low annual household income at both timepoints (£0-5,475 or £5,476-12,097), and those reporting a sharp decline in income between S1 and S2 (drop by two or more income categories). The chronic debt variable grouped those reporting debt at both S1 and S2, and contrasted these against those who never reported debt or reported debt at one timepoint only. Benefits receipt included those reporting receipt of benefits at any timepoint, versus those who never reported any benefits receipt.

Socio-economic factors were not applied to analyses of employment trajectories due to conceptual overlap, and only used in the analyses using the PSF outcome.

**Socio-economic measures**

**Education (S1+S2)**

- No qualifications
- GCSE
- A-level
- Degree

**Adverse employment conditions (S1+S2)**

- No
- Yes

**Low household income (S1+S2)**

- No
- Yes

**Chronic debt (S1+S2)**

- No
- Yes

**Benefits (S1+S2)**

- No
- Yes

Figure 32 Socio-economic measures used in Chapter 5

#### 5.3.3.2.3 Social measures

Social factors included perceived social support (S1), social network size (S1), and stressful life events (S1 and S2) (Figure 33). High emotional support was operationalised as the perceived availability of both emotional and instrumental support, while low social support comprised those reporting neither form of support, or one but not the other. The social network size variable was consisted of 3 categories indicating the number of weekly contacts with different groups of people (e.g. friends, family). Measures of perceived social support and social network size were collectively considered indicators of psychosocial resources and were only available in the S1 survey. Perceived social support was applied to analyses of both the social functioning outcomes. In contrast, social network size was omitted from the PSF analyses due to conceptual overlap between the operationalisation of social network size (number of weekly social contacts e.g. friends) and PSF (limitations in social activities, e.g. seeing friends).

The stressful life events measures consisted of 3 categories, representing the accumulation of all reported stressful experiences in lifetime. The measure was available both in S1 and S2. The S1 measure of stressful life events was applied to the analyses of the employment/education trajectory outcome, while the S2 measure was applied to the PSF analyses.

The decision to use the S1 measure for the employment/education trajectory analyses was informed by literature indicating that adverse employment circumstances may precipitate other stressful life events [245]. Use of the S1+S2 stressful life events measure may thus have measured events which occurred as a consequence of employment change. The S1+S2 measure may therefore not accurately represent the explanatory effect of stressful life events in the association between comorbidity and employment trajectories.

In contrast, the PSF measure captured the past 4 weeks. It was thus less likely that stressful life events may have occurred as a consequence of poor functioning over this relatively short time period. Therefore the S1+S2 stressful life events measure was applied to the analyses of the PSF outcome.

**Social measures**
**Social support (S1)**
- Low
- High

**Social network size (no. weekly contacts) (S1)**
- 2 or less weekly contacts
- 3-4 weekly contacts
- 5 or more weekly contacts

**Stressful life events (S1)**
- 0-2
- 3-5
- 6 or more

**Stressful life events (S1+S2)**
- 0-2
- 3-5
- 6 or more

Figure 33 Social measures used in Chapter 5

#### 5.3.3.2.4 Health-related measures

A separate set of health-related factors was applied to the employment and PSF trajectory analyses (Figure 34). While the PSF analyses captured health over S1 and S2, the analyses of employment trajectories only used health-related factors were measured at S1. Health-related measures over S1 and S2 were not used in the employment analyses given that employment transitions may have taken place at any point between S1 and S2. Thus, health-related factors measured at S2 could plausibly be influenced employment, and would

not capture health-selection effects. For the same reason, MIS at S2 were not tested in the employment analyses. While the same argument may apply to PSF, this variable was informed by a measure capturing PSF over the 4 weeks prior to the interview. It is thus less likely that changes in PSF would have influenced the health-related factors measured at S2, captured over the same time frame as the S2 PSF measure.

The health-related factors applied to the employment trajectory analyses included somatic symptom severity (S1), self-rated health (S1), perceived functioning limitations due to emotional health (S1) and daily functioning problems (S1). These variables were identical to the health-related factors tested as mediators and explanatory factors in Chapter 4 (see 4.2.1.2.2 and 2.7). The health-related factors tested in the PSF analyses included MIS at follow-up (S2), somatic symptom severity (S1+S2), self-rated health (S1+S2) and daily functioning problems (S1+S2) (see 2.7).

3 groups of somatic severity were produced by categorising the total score of the Patient Health Questionnaire 15 somatic symptom severity scale (PHQ-15) into low, moderate and high somatic severity [457]. The S1 and S2 measures were cross-tabulated to produce a derived variable of somatic symptom severity over S1 and S2. The derived variable consisted of 3 categories of 1) low (at S1 and S2), 2) moderate (at S1 and/or S2), and 3) high (at S1 and/or S2) somatic symptom severity.

The self-rated health variable was obtained by recoding the five-point measure from the SF-12 into fair/poor vs. good/very good/excellent [460, 461]. The derived measure of self-rated health over S1 and S2, captured persistently fair/poor (at S1 and S2) vs. good/very good/excellent (at S1 and/or S2).

A binary measure of perceived functioning limitations due to emotional health was used from the SF-12 [460, 461], indicating any specific limitations in functioning due to poor mental health. No measure of perceived functioning limitations over time was derived, due to conceptual overlap with the PFL outcome (5.2.3.2.3).

A cumulative measure of daily life activity domains (personal care, personal care, getting out and about, medical care, household activities and managing money) which respondents reported that they struggled to manage was cut at

two or more to make a binary variable of daily functioning problems. The S1 and S2 measures of daily functioning problems were cross-tabulated to derive a variable measuring such limitations over time. The derived variable distinguished between ≥2 limitations (at S1 and S2) vs. <2 limitations (at S1 and/or S2).

MIS at follow-up captured persons who at S2 scored above threshold (≥12) on the CIS-R (indicative of CMD symptoms), or reported any longstanding mental illness.

**Health-related factors applied to analyses of employment/education trajectories**

**Somatic symptom severity (S1)**
- Low
- Moderate
- High

**Self-rated health (S1)**
- Good/Very good/excellent
- Fair/poor

**Perceived functioning limitations due to emotional health (S1)**
- No
- Yes

**Daily functioning problems (S1)**
- 0-1
- ≥2

**Health-related factors applied to analyses of perceived social functioning trajectories**

**Mental illness symptoms (MIS) (S2)**
- No
- Yes

**Somatic symptom severity (S1+S2)**
- Low
- Moderate
- High

**Self-rated health (S1+S2)**
- Not continuously fair/poor
- Persistently fair/poor

**Daily functioning problems (S1+S2)**
- Not persistently ≥2
- Persistently ≥2

Figure 34 Health-related measures used in Chapter 5

### 5.3.1 Analysis

The analyses used to examine the impact of mental-physical comorbidity on social functioning included cross-tabulations and multinomial regression methods. Trajectories of employment and PSF were used as outcomes in the multinomial regression models, and comorbidity was the independent variable of interest. Stable employment/education and “good : good” PSF represented the reference categories in the multinomial regression analyses testing the impact of comorbidity on trajectories of employment and PSF, respectively.

Post-hoc comparisons between the social functioning outcome categories which were not specified as the reference were tested using the *listcoef* command. Post-hoc comparisons within categorical variables (e.g. non-comorbid MIS vs. MIS-physical comorbidity) were tested by temporarily changing the reference of categorical variables whilst re-running models, separately for different variables.

All analyses were performed using Stata [469]. Estimates were calculated with 95% confidence intervals, and exact p-values from statistical tests (rounded to 3 decimal places) are presented. All analyses were estimated with robust standard errors using the *svy* command, accounting for household clustering and applying the appropriate S2 weighting. The S2 weights accounted for non-response at the household level, attrition and changes in household composition between S1 and S2.

The analytical strategy implemented was similar for the analyses of employment trajectories and PSF trajectories, and is outlined below.

#### 5.3.1.1 Unadjusted associations between comorbidity and social functioning trajectories

Analyses first described the prevalence distribution of social functioning outcomes by mental-physical comorbidity in cross-tabulations with Chi-square tests and Rao Scott corrections. Unadjusted associations were tested in multinomial regression models.

#### 5.3.1.2 Unadjusted associations between explanatory factors and social functioning trajectories

With the exception of somatic symptom severity (S1+S2), self-rated health (S1+S2) and daily functioning problems (S1+S2), all of the explanatory

variables had previously been used in the thesis and had demonstrated an association with comorbidity (Table B8 and Table B9, Appendix B). These health-related indicators measured over S1 and S2 were thus tested in cross-tabulations and multinomial regression analyses with comorbidity.

In order for the explanatory factors to be eligible for inclusion in the analyses as explanatory factors, they also needed to demonstrate associations with the social functioning outcomes. Cross-tabulations and multinomial regression models described and tested the associations between the explanatory factors and the social functioning outcomes. Conventional p-values of 0.05 were considered statistically indicative of an association.

Age and gender were considered explanatory factors of substantial theoretical importance and were therefore a priori decided to be included in both the block-adjusted and fully-adjusted model (outlined below). Given the importance of considering the intersection between ethnicity and migrant status [258], these were a priori decided to be carried forward to the block-adjusted stage, irrespective of the outcome of unadjusted analyses. In line with theoretical work on psychosocial stress [582], psychosocial resources (social network size and/or perceived social support) and social adversity (stressful life events) were also a priori decided to be jointly considered in block-adjusted models, regardless of the unadjusted associations.

Due to conceptual overlap, socio-economic variables were not tested with the employment outcome, and social network size and perceived functioning limitations due to emotional health were not tested with the PSF outcome (see 5.2.3.2.3 and 5.2.3.2.3).

#### 5.3.1.3 Block-adjusted models

Block-adjusted multinomial regression models were performed in order to examine how groups of explanatory factors influenced the association between comorbidity and social functioning outcomes. Variables which were found to be associated with any of the social functioning outcome categories, relative to the reference, were carried forward to the fully-adjusted model. Associations with p-values of <0.05 were considered statistically significant.

#### 5.3.1.4 Fully-adjusted models

Multinomial regression models tested fully-adjusted associations between comorbidity and social functioning outcomes whilst fully adjusting for explanatory factors. The explanatory factors included were informed by the outcomes of the block adjusted analyses, with the exception of age and gender which were a priori decided to be included (see section 5.2.1.2).

## 5.4 Results

### 5.4.1 Trajectories of employment

#### 5.4.1.1 Preliminary descriptive analyses

Among the respondents of working age in the S2 sample, 16.6% were persistently out of employment/education, 6.8% transitioned into employment/education between S1 and S2, and 10.3% transitioned out of employment/education between the timepoints. Sixty-six-point-four percent were in stable employment/education between S1 and S2 (analyses not shown).

The exact transitions between the specific employment categories are shown in Table 9 in Chapter 2. Among those grouped in the persistent out of employment/education category, two thirds stayed within the specific non-employment/education group (unemployed, sick/disabled, carer role, or early retirement) that they initially reported. The vast majority of respondents in the stable employment/education category were employed at both S1 and S2. Within this group, over half of the students transitioned into employment. Among those who transitioned into employment/education between S1 and S2, most transitioned into employment rather than education. Over half of persons in this transition category moved from unemployment into employment. A majority of respondents transitioning from employment/education into non-employment/education moved from employment, rather than education. However, in relative terms, a larger proportion of students transitioned from education to non-employment/education, compared to persons initially in employment (unweighted proportions: 21.2% vs. 10.5%; analyses not shown).

129 respondents aged over 65 were excluded. Of these, 93 were retired at both S1 and S2, and 22 were employed at S1 and S2. Transitions into retirement at S2 included respondents who were previously employed (n=7), unemployed (n=2) or permanently sick/disabled (n=3) at S1. Two persons transitioned from retirement at S1 into employment at S2 (analyses not shown). Compared to those of working age, the excluded respondents reported more non-comorbid physical illness (19.7% vs. 58.2%), and less non-comorbid MIS (15.4% vs 6.8%), but MIS-physical comorbidity estimates were similar (16.4% vs 15.1%; analyses not shown).

#### 5.4.1.2 Prevalence distribution and unadjusted associations between comorbidity and trajectories of employment

Of those reporting mental-physical comorbidity 39.1% were persistently out of employment/education and a similar proportion were in stable employment/education (Table 41). The remaining comorbidity respondents were roughly equally distributed across the transition categories. This distribution stood in sharp contrast to the distribution of employment trajectories by no MIS and non-comorbid MIS. Eleven-point-five percent of those reporting no MIS and 14.7% of those reporting non-comorbid MIS were persistently out of employment/education; less than half the prevalence observed in the comorbidity group. Those reporting no MIS had the highest prevalence of stable employment/education (73.2%), and lower prevalence estimates of both employment/education transition groups compared to non-comorbid and comorbid MIS.

The unadjusted multinomial regression model indicated that compared to no MIS, the comorbidity group was at over six times greater risk of reporting persistent non-employment/education, relative to stable employment/education (Table 41). Those reporting comorbidity were also at over doubled the relative risk of placement in the employment/education transition groups. The comorbidity group was at statistically greater risk of persistent non-employment/education relative to transitions out of employment/education ($p=0.002$), but not relative to transitions into of employment/education ($p=0.060$; analyses not shown).

In contrast, the non-comorbid MIS group was not at greater risk of placement in any of the employment trajectory groups relative to stable employment/education. Post-hoc tests indicated that compared to non-comorbid MIS, the comorbidity group was at over four times greater risk of placement in the persistent employment/education outcome group, but was at no greater risk of placement in the transitioning employment/education groups (analyses not shown).

Table 41 Unadjusted associations of comorbidity and employment/education trajectories from S1 to S2

| | Stable employment/ education (n=641) | | Transition into employment/ education (n=56) | | | Transition out of employment/ education (n=89) | | | Persistently out of employment/ education (n=132) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | | n | % | | n | % | |
| ***Comorbidity (S1)*** | | | | | | | | | | | |
| No MIS | 486 | 73.2 | 34 | 5.9 | | 56 | 9.4 | | 64 | 11.5 | |
| Non-comorbid MIS | 92 | 65.3 | 9 | 7.7 | | 16 | 12.3 | | 18 | 14.7 | |
| MIS-physical comorbidity | 61 | 40.3 | 12 | 9.5 | | 16 | 11.1 | | 49 | 39.1 | |
| | RRR | | RRR | (95% CI) | *p* | RRR | (95% CI) | *p* | RRR | (95% CI) | *p* |
| ***Comorbidity (S1)*** | | | | | | | | | | | |
| No MIS | | | 1.00 | | | 1.00 | | | 1.00 | | |
| Non-comorbid MIS | 1.00 | | 1.48 | (0.68-3.22) | 0.326 | 1.46 | (0.79-2.71) | 0.231 | 1.43 | (0.80-2.55) | 0.230 |
| MIS-physical comorbidity | 1.00 | | 2.94 | (1.41-6.10) | 0.004 | 2.14 | (1.14-4.03) | 0.018 | 6.18[a] | (3.80-10.05) | <0.001 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms

"Stable employment/education" represents the reference category in the multinomial regression.

Post-hoc tests repeated the cross-tabulation and unadjusted multinomial regression model using the four-category comorbidity variable. These analyses distinguished non-comorbid physical illness from no identified illness in the no MIS reference group. A higher proportion of persons reporting non-comorbid physical illness were in the persistent employment/education outcome group (18.9%) compared to no identified illness (8.5%) and non-comorbid MIS (14.7%), but was substantially lower compared to the comorbidity group (39.1%). The multinomial regression model indicated that the non-comorbid physical illness group was at 2.46 greater risk of placement in the persistent group, compared to those reporting no identified illness. The comorbidity group was at 8.61 greater relative risk of placement in the persistent employment/education category compared to no identified illness, and at 3.49 greater relative risk compared to non-comorbid physical illness. The non-comorbid physical category was not different from the no identified illness group in terms of placement in the transitioning employment/education groups.

#### 5.4.1.3 Block adjusted associations of comorbidity and trajectories of employment

The distributions of the explanatory factors by employment trajectories and unadjusted associations between explanatory factors and employment trajectories are shown in Table C2 and Table C3 in Appendix C. All explanatory factors were associated with at least one of the employment trajectory outcome categories, and all but ethnicity were associated with persistent non-employment/education (Table C3, Appendix C). Thus, all explanatory factors were carried forward to block-adjusted tests.

Adjusted associations between comorbidity and employment trajectory outcomes, separately accounting for groups of explanatory factors are shown in Table 42.

##### 5.4.1.3.1 The socio-demographic model

After adjusting for socio-demographic factorsthe association between comorbidity and persistent non-employment/education was attenuated but remained substantially elevated. The associations between comorbidity and

transitions in or out of employment/education were not markedly affected by socio-demographic adjustment.

Whilst no unadjusted association was observed, non-comorbid MIS was associated with greater relative risk of persistent non-employment/education after adjusting for socio-demographic factors. This negative confounding effect was driven by age. Compared to those reporting no MIS (of which one-third reported non-comorbid physical illness), the non-comorbid MIS group was substantially younger (Table B4, Appendix B). Older age was in turn associated with persistent non-employment/education (Table C3). This resulted in a net effect producing an observed association between non-comorbid MIS and persistent non-employment/education.

The Black-Caribbean ethnic group was associated with a robust 2-fold increased relative risk of transitions into employment/education. This was driven by transitions from unemployment into either employment or education among the Black Caribbean ethnic group (analyses not shown). The relative risk ratio was particularly large given that the Black Caribbean group was less prevalent in the stable employment/education group compared to all other ethnic groups (61.3% vs ≥65.7% Table C2, Appendix C). The effect was not influenced by migration status (analyses not shown).

Migrant status and relationship status were not associated with any of the employment trajectory outcomes and were thus dropped from further analyses, while ethnicity, age and gender were carried forward to the fully-adjusted model.

##### 5.4.1.3.1 The social model

After adjusting for social factors, the comorbidity group remained at elevated relative risk of placement in the outcome category of persistent non-employment/education, compared to no MIS, although the association was substantially attenuated. The comorbidity group also was also at greater relative risk of placement in this group compared to non-comorbid MIS (RRR=3.18, p=0.001, analyses not shown). However, comorbidity group was not associated with either of the transitioning employment categories, compared to either no MIS or non-comorbid MIS.

Social network size and stressful life events jointly made the largest contributions to the substantial attenuation in the association between

comorbidity and persistent non-employment/education. Low social support, small social networks and greater numbers of stressful life events were independently associated with persistent non-employment/education as well as transitions into employment, with very similar effect sizes. In contrast, only stressful life events were associated with transitions out of employment/education. All social indicators were thus carried forward to the fully-adjusted model.

5.4.1.3.2 The health-related model

In contrast to the socio-demographic and social block-adjusted models, the association between comorbidity and persistent non-employment/education was fully attenuated after adjusting for health-related factors. The comorbidity group was also no more likely to be placed in the persistent non-employment/education group, compared to the non-comorbid MIS group (analyses not shown). Further, the comorbidity group was not associated with either of the employment/education transitions over time, either compared to no MIS or non-comorbid MIS (analyses not shown).

Whilst all health-related variables substantially attenuated the association between comorbidity and persistent non-employment/education independently, no single variable fully attenuated the association (analyses not shown). Of the indicators of perceived health and functioning, somatic symptom severity exerted the most influential effect in terms of attenuating the association (analyses not shown).

All indicators of perceived health and functioning were strongly associated with persistent non-employment/education. High somatic symptom severity was the only health-related indicator associated with transitions into employment/education, and perceived functioning limitations was the only indicator associated with transitions out of employment/education. All indicators of perceived health and functioning were therefore tested in the fully-adjusted model.

Table 42 Associations of comorbidity and employment/education trajectories from S1 to S2, block-adjusted for socio-demographic, social and health-related factors

| | Stable employment / education (n=641) | Transition into employment/ education (n=56) | | Transition out of employment/ education (n=89) | | Persistently out of employment/ education (n=132) | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Block-adjusted model of socio-demographic factors*** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.46 (0.69-3.12) | 0.323 | 1.41 (0.76-2.63) | 0.273 | 1.91 (1.02-3.60) | 0.045 |
| MIS-physical comorbidity | 1.00 | 3.00 (1.35-6.66) | 0.007 | 2.07 (1.07-4.01) | 0.031 | 4.47 (2.66-7.49) | <0.001 |
| ***Female gender (S1)*** | 1.00 | 1.49 (0.79-2.80) | 0.216 | 1.69 (1.05-2.72) | 0.032 | 1.54 (1.02-2.31) | 0.038 |
| ***Age (continuous) (S1)*** | 1.00 | 0.99 (0.96-1.02) | 0.666 | 1.01 (0.98-1.03) | 0.562 | 1.07 (1.04-1.09) | <0.001 |
| ***Relationship status*** | | | | | | | |
| Married/cohabitating | | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.00 | 0.94 (0.48-1.84) | 0.862 | 1.57 (0.87-2.82) | 0.134 | 1.39 (0.79-2.47) | 0.254 |
| Previously in relationship | 1.00 | 0.99 (0.39-2.52) | 0.975 | 1.22 (0.56-2.68) | 0.612 | 1.15 (0.64-2.09) | 0.636 |
| ***Non-White ethnicity (S1 )*** | | | | | | | |
| White | | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.00 | 2.47 (1.03-5.92) | 0.043 | 1.57 (0.71-3.49) | 0.263 | 0.92 (0.38-2.23) | 0.854 |
| Black African | 1.00 | 0.79 (0.31-2.02) | 0.624 | 1.83 (0.92-3.65) | 0.087 | 0.99 (0.44-2.21) | 0.983 |
| Other | 1.00 | 0.94 (0.37-2.35) | 0.890 | 1.46 (0.76-2.78) | 0.253 | 1.54 (0.77-3.07) | 0.224 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.44 (0.65-3.16) | 0.370 | 1.14 (0.60-2.16) | 0.681 | 0.88 (0.42-1.85) | 0.735 |
| ≥10 years in the UK | 1.00 | 2.02 (0.97-4.19) | 0.061 | 1.11 (0.56-2.22) | 0.757 | 1.01 (0.56-1.81) | 0.979 |
| ***Block-adjusted model of social factors*** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Non-comorbid MIS | 1.00 | 1.12 (0.51-2.47) | 0.781 | 1.31 (0.70-2.45) | 0.402 | 1.02 (0.56-1.87) | 0.949 |
| MIS-physical comorbidity | 1.00 | 1.65 (0.79-3.47) | 0.186 | 1.72 (0.92-3.23) | 0.090 | 3.24 (1.80-5.83) | <0.001 |
| ***High social support (S1)*** | 1.00 | 0.43 (0.21-0.85) | 0.015 | 0.81 (0.42-1.57) | 0.536 | 0.43 (0.25-0.74) | 0.002 |
| ***Social network size (S1)*** | | | | | | | |
| 2 or less contacts | | 1.00 | | 1.00 | | 1.00 | |
| 3-4 contacts | 1.00 | 0.69 (0.24-2.00) | 0.493 | 0.90 (0.29-2.76) | 0.851 | 0.39 (0.17-0.88) | 0.024 |
| 5 or more contacts | 1.00 | 0.18 (0.06-0.51) | 0.001 | 0.56 (0.20-1.60) | 0.279 | 0.09 (0.04-0.21) | <0.001 |
| ***Stressful life events (S1)*** | | | | | | | |
| 0-2 | | 1.00 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 2.29 (1.09-4.82) | 0.029 | 1.15 (0.67-1.98) | 0.617 | 1.13 (0.65-1.96) | 0.665 |
| 6 or more | 1.00 | 3.22 (1.36-7.62) | 0.008 | 2.05 (1.09-3.87) | 0.027 | 2.94 (1.63-5.30) | <0.001 |
| ***Block-adjusted model of health-related factors*** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.24 (0.51-3.03) | 0.632 | 0.74 (0.37-1.52) | 0.416 | 0.75 (0.39-1.44) | 0.387 |
| MIS-physical comorbidity | 1.00 | 1.74 (0.75-4.08) | 0.199 | 0.87 (0.41-1.87) | 0.729 | 1.39 (0.72-2.67) | 0.330 |
| ***Somatic symptom severity (S1)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 0.51 (0.22-1.15) | 0.106 | 1.15 (0.66-2.00) | 0.619 | 1.63 (0.95-2.78) | 0.074 |
| High | 1.00 | 2.30 (1.07-4.93) | 0.032 | 1.64 (0.71-3.78) | 0.247 | 3.52 (1.75-7.07) | <0.001 |
| ***Fair/poor self-rated health (S1)*** | 1.00 | 0.79 (0.31-2.05) | 0.631 | 1.34 (0.69-2.64) | 0.389 | 2.29 (1.31-4.02) | 0.004 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 1.39 (0.58-3.33) | 0.458 | 3.41 (1.91-6.10) | <0.001 | 1.45 (0.81-2.59) | 0.210 |
| ***Daily functioning problems (S1)*** | 1.00 | 3.22 (0.90-11.44) | 0.071 | 1.49 (0.45-4.98) | 0.518 | 5.99 (2.63-13.64) | <0.001 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms

"Stable employment/education" represents the reference category in the multinomial regression.

#### 5.4.1.4 Fully-adjusted associations of comorbidity and trajectories of employment

In the fully-adjusted model all of the unadjusted associations were fully attenuated. Comorbidity and non-comorbid MIS were not associated with persistent non-employment/education or transitions in or out of employment/education (Table 43).

Small social networks, daily functioning problems, and moderate and high somatic symptom severity were the indicators most strongly associated with persistent non-employment/education. Post-hoc analyses indicated that those reporting two or fewer contacts a week were at 12 times elevated risk of placement in the persistent non-employment/education outcome category, compared to those reporting six or more social contacts. Daily functioning problems were nearly at four times elevated relative risk of persistent non-employment/education, and high somatic symptom severity was associated with over 3 times greater relative risk. The risk of placement in the persistent non-employment/education outcome category was also elevated for women and those reporting low perceived social support, and the relative risk increased with age. Given that 98.7% of carers at S1 or S2 were women, sensitivity analyses excluded carers and found that the gender differences in employment/education transitions were entirely explained by women being in caring roles (analyses not shown).

For somatic symptom severity, a U-shaped pattern was observed such that those reporting moderate somatic symptom severity were at lower relative risk of transitions into employment/education, compared to those reporting both low and high somatic symptom severity ($p \leq 0.049$; analyses not shown).

As in the block-adjusted model of social indicators, low social support and small social networks were associated with transitions into employment/education, with effect sizes of similar strength to those the associations with persistent non-employment/education. However, neither of the indicators of psychosocial resources were associated transitions out of employment/ education. Stressful life events were not associated with persistent non-employment/education, but were associated with transitions into and out of employment/education instead.

Table 43 Fully-adjusted model of comorbidity and employment/education trajectories from S1 to S2

| | **Stable employment / education (n=641)** | **Transition into employment/ education (n=56)** | | **Transition out of employment/ education (n=89)** | | **Persistently out of employment/ education (n=132)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.14 (0.47-2.78) | 0.778 | 0.73 (0.36-1.47) | 0.376 | 0.91 (0.43-1.93) | 0.797 |
| MIS-physical comorbidity | 1.00 | 1.45 (0.60-3.50) | 0.405 | 1.00 (0.47-2.11) | 0.992 | 0.86 (0.36-2.04) | 0.727 |
| ***Female gender (S1)*** | 1.00 | 1.94 (0.99-3.78) | 0.052 | 1.67 (1.02-2.72) | 0.042 | 1.66 (1.04-2.63) | 0.032 |
| ***Age (continuous) (S1)*** | 1.00 | 1.00 (0.97-1.02) | 0.846 | 1.00 (0.97-1.02) | 0.753 | 1.06 (1.04-1.09) | <0.001 |
| ***Non-White ethnicity (S1 )*** | 1.00 | 0.89 (0.48-1.64) | 0.716 | 1.55 (0.93-2.57) | 0.090 | 0.80 (0.46-1.38) | 0.418 |
| ***High social support (S1)*** | 1.00 | 0.45 (0.22-0.92) | 0.028 | 1.03 (0.52-2.03) | 0.934 | 0.51 (0.27-0.95) | 0.033 |
| ***Social network size (S1)*** | | | | | | | |
| 2 or less contacts | | 1.00 | | 1.00 | | 1.00 | |
| 3-4 contacts | 1.00 | 0.66 (0.23-1.90) | 0.442 | 1.00 (0.32-3.14) | 0.996 | 0.41 (0.17-0.95) | 0.037 |
| 5 or more contacts | 1.00 | 0.16 (0.06-0.46) | <0.001 | 0.72 (0.24-2.11) | 0.544 | 0.08 (0.03-0.18) | <0.001 |
| ***Stressful life events (S1)*** | | | | | | | |
| 0-2 | | 1.00 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 2.34 (1.05-5.21) | 0.037 | 1.10 (0.63-1.93) | 0.730 | 0.84 (0.46-1.53) | 0.564 |
| 6 or more | 1.00 | 3.30 (1.27-8.55) | 0.014 | 2.03 (1.00-4.12) | 0.051 | 1.68 (0.83-3.40) | 0.152 |
| ***Somatic symptom severity (S1)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 0.41 (0.17-0.97) | 0.042 | 1.10 (0.63-1.90) | 0.740 | 1.31 (0.71-2.44) | 0.384 |
| High | 1.00 | 1.49 (0.63-3.53) | 0.360 | 1.24 (0.52-2.91) | 0.628 | 3.16 (1.31-7.59) | 0.010 |
| ***Fair/poor self-rated health (S1)*** | 1.00 | 0.66 (0.28-1.56) | 0.340 | 1.31 (0.69-2.47) | 0.408 | 1.68 (0.85-3.31) | 0.132 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 1.01 (0.44-2.33) | 0.983 | 2.97 (1.65-5.34) | <0.001 | 0.97 (0.50-1.90) | 0.934 |
| ***Daily functioning problems (S1)*** | 1.00 | 2.42 (0.74-7.95) | 0.145 | 1.30 (0.36-4.69) | 0.684 | 3.89 (1.50-10.07) | 0.005 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms

"Stable employment/education" represents the reference category in the multinomial regression.

### 5.4.2 Trajectories of perceived social functioning

#### 5.4.2.1 Preliminary descriptive analyses

Of the full S2 sample 65.9% reported continuously good PSF between S1 and S2, while 12.3% reported persistently poor functioning. Nine-point-five percent reported improved functioning over time, while 12.3% reported poorer PSF at S2 than at S1 (analyses not shown).

The exact transitions made on the six-point scale of PSF between S1 and S2 are shown in Table 11 in Chapter 2. The largest cell in the cross-tabulation of PSF at S1 and S2 was functioning impairment “none of the time” at both timepoints. Most transitions involved moves of one or two categories in either direction on the PSF scale, while extreme transitions from the either end of the scale were more unusual (e.g. reporting PSF impairment “none of the time” at S1 and “all of the time” at S2). However, there was a tendency among those reporting PSF impairments “none of the time” at S2 to have made larger transitions from poor PSF at S1.

#### 5.4.2.2 Prevalence distribution and unadjusted associations between comorbidity and trajectories of perceived social functioning (PSF)

The prevalence distribution of PSF trajectories by comorbidity indicated that the comorbidity group was more likely to report persistently poor PSF than any other PSF trajectory (Table 44). Of respondents in the comorbidity group, 39.9% reported persistently poor PSF while 23.2% reported continuously good functioning. The comorbidity respondents who did not report persistently poor or continuously good functioning were approximately evenly distributed across the transitioning functioning groups (18.0% and 18.9%).

The proportion of comorbidity respondents reporting persistently poor functioning was nearly twice the proportion the non-comorbid MIS group reporting persistently poor functioning, and nearly ten times the proportion of the no MIS group. In contrast, the proportion of the non-comorbid MIS group reporting continuously good functioning was nearly twice the equivalent proportion of the comorbidity group (43.5% vs 23.2%), while the proportion

reporting continuously good functioning among the no MIS group was 3-fold the prevalence of the comorbidity group (80.3% vs 23.2%).

Those who reported non-comorbid MIS were more likely to report improved than poorer PSF in S2 (21.6% vs. 13.3%). In contrast, a small proportion of the no MIS group reported improved functioning at S2 (5.2%), while a greater proportion reported poorer functioning at S2 (10.5%).

The unadjusted multinomial regression model indicated strong associations between comorbidity and persistently poor functioning (Table 44). Relative to the reference of continuously good functioning, the comorbidity group was at 34.5 greater risk of placement in the persistently poor PSF outcome category, compared to no MIS. The comorbidity group was also at substantially greater risk of placement in the transitioning PSF categories, with effect sizes of 12.08 for improved PSF and 6.24 for poorer PSF. Relative to either of the transitioning functioning outcome categories, the comorbidity group was nevertheless at greater risk of placement in the persistently poor PSF outcome category (RRR=2.86, p=0.003 relative to the reference of “poor : good”; RRR=5.53, p<0.001 relative to the reference of “good : poor”; analyses not shown).

Those reporting non-comorbid MIS were also at high risk of placement in the persistently poor as well as the transitioning PSF outcome groups, compared to the no MIS group. However, the associations between comorbidity and all PSF outcome categories were stronger compared to the equivalent associations between the non-comorbid MIS group and trajectories of PSF. Compared to the non-comorbid MIS group, the comorbidity group was at greater relative risk of placement in the good-to-poor PSF outcome (RRR=2.67, p=0.008) and the persistently poor PSF outcome (RRR=3.45, p<0.001; analyses not shown). In contrast, the comorbidity group was not at statistically elevated risk of placement in the improved PSF outcome category, compared to non-comorbid MIS (RRR=1.56, p=0.183; analyses not shown).

Table 44 Unadjusted associations of comorbidity and perceived social functioning trajectories

| | **Good : good (n=710)** | | **Poor : good (n=97)** | | | **Good : poor (n=121)** | | | **Poor : poor (n=115)** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | | n | % | | n | % | |
| ***Comorbidity (S1)*** | | | | | | | | | | | |
| No MIS | 601 | 80.3 | 37 | 5.2 | | 75 | 10.5 | | 26 | 4.0 | |
| Non-comorbid MIS | 66 | 43.5 | 32 | 21.6 | | 18 | 13.3 | | 29 | 21.6 | |
| MIS-physical comorbidity | 41 | 23.2 | 28 | 18.0 | | 27 | 18.9 | | 59 | 39.9 | |
| | RRR | | RRR (95% CI) | | *p* | RRR (95% CI) | | *p* | RRR (95% CI) | | *p* |
| ***Comorbidity (S1)*** | | | | | | | | | | | |
| No MIS | | | 1.00 | | | 1.00 | | | 1.00 | | |
| Non-comorbid MIS | 1.00 | | 7.74 (4.49-13.35) | | <0.001 | 2.34[a] (1.31-4.17) | | 0.004 | 10.00[a] (5.49-18.22) | | <0.001 |
| MIS-physical comorbidity | 1.00 | | 12.08 (6.55-22.27) | | <0.001 | 6.24[a] (3.53-11.02) | | <0.001 | 34.50[a] (19.35-61.49) | | <0.001 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms
"Good : good" represents the reference category in the multinomial regression.

#### 5.4.2.3 Block adjusted associations of comorbidity and perceived social functioning (PSF)

Somatic symptom severity (S1+S2), self-rated health (S1+S2) and daily functioning problems (S1+S2) were health-related factors derived from measures at S1 and S2, and had not previously been used in the thesis. Associations between these variables with comorbidity were therefore tested, and are presented in Table C1, Appendix C. All indicators were strongly associated with comorbidity, and somatic symptom severity and self-rated health were also associated with non-comorbid MIS

The distribution of PSF trajectories by explanatory factors and tested associations are shown in Table C4 and Table C5 in Appendix C. All explanatory factors, with the exception ethnicity and migrant status, were associated with at least one of the PSF outcome categories and were thus carried forward to the block-adjusted models. Given that ethnicity and migrant status were a priori decided to be tested in a socio-demographic block-adjusted model, these were also carried forward to the next analytical stage. The block-adjusted associations between comorbidity and PSF trajectories are shown in Table 45.

##### 5.4.2.3.1 The socio-demographic model

After adjusting for socio-demographic factors the comorbidity group remained associated at substantially elevated relative risk of placement in the persistently poor functioning outcome group (Table 45). Indeed, the adjusted association was slightly stronger than the unadjusted association. This negative confounding effect was explained by ethnicity. In the S2 sample, Non-White ethnic groups were less likely to report mental-physical comorbidity compared to White ethnic groups, relative to no MIS (RRR=0.71, p=0.086; analyses not shown), but were at slightly greater relative risk of reporting persistently poor PSF (Table C5). After accounting for ethnicity the association between comorbidity and persistently poor functioning was therefore strengthened. The relative risk of placement in the persistently poor group was also elevated for women and increased with age.

Adjusting for socio-demographic factors strengthened the association between non-comorbid MIS and persistently poor PSF. The younger age of the non-comorbid MIS group, relative to no MIS (Table B7, Appendix B), drove this negative confounding effect. Age as well as migrant status contributed to a similar negative confounding effect observed for the association between non-comorbid MIS and functioning transitions of poor-to-good.

Age and migration status also contributed to a negative cofounding effect observed among Black African and Other ethnic groups. After adjusting for other socio-demographic indicators, these groups were at elevated risk of placement in the transition group of good-to-poor functioning. This was explained by younger and non-migrant respondents of Black African and Other ethnicity reporting poorer PSF from S1 to S2 (analyses not shown). The intersection between ethnicity and migrant status also contributed to a negative confounding effect on the relative risk of placement in the good-to-poor functioning outcome for the comorbidity group. Compared to non-migrants of White ethnicity, all non-migrant ethnic minority groups were at greater relative risk of poorer functioning over time, such that after accounting for both ethnicity and migrant status, the association between comorbidity and good-to-poor functioning transitions was strengthened.

Age and gender were carried forward to the fully–adjusted model as an a priori decision, and ethnicity was carried forward as Black African ethnicity was associated with good-to-poor PSF transitions. Given that migrant status made important contributions to several intersectional effects, the variable was also carried forward to the fully-adjusted model, despite that it was not associated with any of the functioning outcomes. In contrast, relationship status was dropped from subsequent analyses given that it was not associated with any of the functioning outcomes and did not contribute to any intersectional effects.

5.4.2.3.2 The socio-economic model

Adjusting for socio-economic factors substantially attenuated the association between comorbidity and persistently poor PSF, although the effect size remained very large (RRR=27.41, Table 45). The associations between comorbidity and the transitioning functioning outcome categories were only slightly attenuated. In contrast, the associations between non-comorbid MIS

and all the PSF trajectory outcomes were largely unaffected by adjusting for socio-economic factors.

Associations between the SES indicators and the PSF trajectory outcomes varied. Adverse employment conditions and benefits receipt were associated with greater risk of placement in persistently poor functioning category. Adverse employment conditions were also associated with PSF poor-to-good transitions. In contrast, GCSE qualifications and low household income were specifically associated with greater risk of placement in the good-to-poor functioning outcome. Chronic debt was not associated with any of the PSF outcomes and was thus dropped from further analyses, while all other SES indicators were carried forward to the fully-adjusted model.

5.4.2.3.3 The social model

Adjusting for perceived social support and stressful life events contributed to a substantial attenuation in the association between comorbidity and persistently poor PSF (Table 45). Associations between comorbidity and the PSF transition outcomes were, in contrast, not substantially affected by the social factors, but remained strong. Associations between non-comorbid MIS and all PSF trajectories were rendered slightly stronger, after accounting for the social factors.

Low perceived social support and greater numbers of stressful life events were independently associated with persistently poor PSF. Low social support was also associated with greater relative risk of placement in the transition good-to-poor group, and stressful life events were associated with poor-to-good PSF transitions. Thus both the social factors were included in the fully-adjusted model.

5.4.2.3.4 The health-related model

Adjusting for perceived health and functioning resulted in the largest attenuations in the associations between both comorbid and non-comorbid MIS with all PSF trajectory outcomes (Table 45). Nevertheless, comorbidity and non-comorbid MIS remained associated with over four-fold greater risks of placement in the persistently poor PSF outcome group. Both the comorbidity group and the non-comorbid MIS group were also at greater risk of placement in the transition group of poor-to-good PSF. In contrast, the associations between both non-comorbid and comorbid MIS with good-to-poor functioning

transitions were fully attenuated. The non-comorbid and comorbid groups did not differ in their relative risks of placements in any of the PSF trajectory outcomes (analyses not shown).

All indicators of poor health and functioning were independently associated with greater risk persistently poor PSF, relative to continuously good functioning. High somatic symptom severity and MIS at S2 were the indicators most strongly associated with persistently poor PSF, with effect sizes of over 8. All indicators were also associated with transitions of good-to-poor PSF. In addition, high somatic symptom severity and daily functioning problems were associated with poor-to-good transitions. Thus, all health-related factors were carried forward to the fully-adjusted model.

Table 45 Associations of comorbidity and perceived social functioning (PSF) trajectories over S1 and S2, block-adjusted for socio-demographic, socio-economic, social and health-related factors

| | **Good : good (n=710)** | **Poor : good (n=97)** | | **Good : poor (n=121)** | | **Poor : poor (n=115)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Block-adjusted model of socio-demographic factors*** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 8.66 (4.85-15.45) | <0.001 | 2.42 (1.29-4.53) | 0.006 | 12.05 (6.57-22.11) | <0.001 |
| MIS-physical comorbidity | 1.00 | 11.77 (6.28-22.08) | <0.001 | 7.04 (3.90-12.74) | <0.001 | 35.09 (19.23-64.00) | <0.001 |
| ***Female gender (S1)*** | 1.00 | 1.32 (0.81-2.17) | 0.265 | 1.53 (0.97-2.39) | 0.066 | 2.01 (1.20-3.37) | 0.008 |
| ***Age (continuous) (S1)*** | 1.00 | 1.02 (1.00-1.04) | 0.031 | 1.01 (0.99-1.03) | 0.272 | 1.02 (1.00-1.04) | 0.019 |
| ***Relationship status*** | | | | | | | |
| Married/cohabitating | | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.00 | 1.66 (0.91-3.05) | 0.101 | 1.38 (0.80-2.38) | 0.250 | 1.52 (0.88-2.65) | 0.136 |
| Previously in relationship | 1.00 | 0.89 (0.44-1.82) | 0.752 | 1.55 (0.85-2.80) | 0.149 | 1.30 (0.66-2.57) | 0.451 |
| ***Ethnicity (S1 )*** | | | | | | | |
| White | | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.00 | 0.86 (0.35-2.13) | 0.751 | 1.43 (0.64-3.19) | 0.389 | 0.88 (0.32-2.47) | 0.814 |
| Black African | 1.00 | 0.87 (0.37-2.05) | 0.751 | 2.35 (1.13-4.88) | 0.022 | 2.07 (0.89-4.82) | 0.091 |
| Other | 1.00 | 0.68 (0.28-1.63) | 0.382 | 2.04 (1.07-3.88) | 0.031 | 1.83 (0.91-3.70) | 0.090 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 0.86 (0.39-1.88) | 0.700 | 0.95 (0.48-1.87) | 0.881 | 0.95 (0.42-2.19) | 0.913 |
| ≥10 years in the UK | 1.00 | 1.09 (0.56-2.09) | 0.806 | 0.69 (0.37-1.32) | 0.265 | 1.02 (0.52-2.01) | 0.950 |
| ***Block-adjusted model of socio-economic factors*** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Non-comorbid MIS | 1.00 | 7.23 | (3.71-14.11) | <0.001 | 2.08 | (1.04-4.16) | 0.039 | 10.14 | (5.02-20.47) | <0.001 |
| MIS-physical comorbidity | 1.00 | 11.12 | (5.47-22.61) | <0.001 | 4.04 | (2.03-8.04) | <0.001 | 27.41 | (13.68-54.95) | <0.001 |
| ***Education (S1+S2)*** | | | | | | | | | | |
| No qualifications | 1.00 | 0.47 | (0.15-1.47) | 0.195 | 0.68 | (0.25-1.84) | 0.448 | 0.71 | (0.27-1.87) | 0.487 |
| GCSE | 1.00 | 1.27 | (0.63-2.57) | 0.505 | 2.45 | (1.32-4.54) | 0.005 | 1.71 | (0.72-4.06) | 0.226 |
| A-level | 1.00 | 1.38 | (0.73-2.63) | 0.322 | 1.47 | (0.80-2.72) | 0.213 | 1.53 | (0.78-2.99) | 0.217 |
| Degree or above | | 1.00 | | | 1.00 | | | 1.00 | | |
| ***Adverse employment conditions (S1+S2)*** | 1.00 | 2.71 | (1.31-5.61) | 0.008 | 1.74 | (0.96-3.18) | 0.069 | 2.29 | (1.17-4.49) | 0.015 |
| ***Low household income (S1+S2)*** | 1.00 | 1.11 | (0.55-2.27) | 0.767 | 2.03 | (1.11-3.73) | 0.023 | 1.57 | (0.80-3.06) | 0.188 |
| ***Chronic debt (S1+S2)*** | 1.00 | 1.19 | (0.45-3.15) | 0.721 | 1.69 | (0.82-3.51) | 0.156 | 2.00 | (0.85-4.69) | 0.110 |
| ***Benefits receipt (S1+S2)*** | 1.00 | 1.42 | (0.75-2.70) | 0.280 | 1.48 | (0.85-2.59) | 0.168 | 2.28 | (1.21-4.29) | 0.011 |
| ***Block-adjusted model of social factors*** | | | | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | | | | |
| No MIS | | 1.00 | | | 1.00 | | | 1.00 | | |
| Non-comorbid MIS | 1.00 | 8.16 | (4.61-14.42) | <0.001 | 2.56 | (1.43-4.59) | 0.002 | 10.40 | (5.67-19.09) | <0.001 |
| MIS-physical comorbidity | 1.00 | 12.37 | (6.59-23.23) | <0.001 | 6.00 | (3.27-11.03) | <0.001 | 26.55 | (14.63-48.19) | <0.001 |
| ***High social support (S1)*** | 1.00 | 0.77 | (0.41-1.42) | 0.399 | 0.53 | (0.33-0.88) | 0.013 | 0.36 | (0.21-0.61) | <0.001 |
| ***Stressful life events (S1+S2)*** | | | | | | | | | | |
| 0-2 | | 1.00 | | | 1.00 | | | 1.00 | | |
| 3-5 | 1.00 | 2.62 | (1.13-6.08) | 0.025 | 1.26 | (0.70-2.25) | 0.439 | 2.07 | (0.82-5.20) | 0.124 |
| 6 or more | 1.00 | 2.55 | (1.08-6.02) | 0.033 | 1.51 | (0.81-2.82) | 0.196 | 3.50 | (1.41-8.70) | 0.007 |
| ***Block-adjusted model of health-related factors*** | | | | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | | | | |
| No MIS | | 1.00 | | | 1.00 | | | 1.00 | | |
| Non-comorbid MIS | 1.00 | 6.17 | (3.49-10.92) | <0.001 | 1.42 | (0.74-2.73) | 0.294 | 4.47 | (2.18-9.16) | <0.001 |
| MIS-physical comorbidity | 1.00 | 5.41 | (2.66-10.98) | <0.001 | 1.68 | (0.85-3.29) | 0.133 | 4.13 | (2.01-8.47) | <0.001 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***MIS (S2)*** | 1.00 | 1.60 (0.85-3.00) | 0.142 | 4.55 (2.70-7.65) | <0.001 | 8.16 (4.31-15.44) | <0.001 |
| ***Somatic symptom severity (S1+S2)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 1.47 (0.81-2.67) | 0.204 | 2.58 (1.50-4.45) | <0.001 | 3.04 (1.19-7.80) | 0.022 |
| High | 1.00 | 3.57 (1.80-7.11) | <0.001 | 3.31 (1.61-6.78) | 0.001 | 8.66 (3.13-23.96) | <0.001 |
| ***Fair/poor self-rated health (S1+S2)*** | 1.00 | 1.16 (0.63-2.13) | 0.639 | 1.75 (1.00-3.07) | 0.052 | 2.62 (1.42-4.85) | 0.002 |
| ***Daily functioning problems (S1+S2)*** | 1.00 | 3.89 (1.57-9.64) | 0.003 | 2.91 (1.15-7.41) | 0.025 | 4.78 (1.90-12.05) | <0.001 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms
"Good : good" represents the reference category in the multinomial regression.

#### 5.4.2.4 Fully-adjusted associations of comorbidity and trajectories of perceived social functioning (PSF)

In the fully adjusted model, the comorbidity group remained at over 3 times greater relative risk of placement in the persistently poor PSF trajectory group, compared to no MIS (Table 46). The non-comorbid MIS group was at even greater risk of persistently poor functioning with an effect size well over 6. However, the relative risks between the non-comorbid and the comorbid groups did not differ statistically (RRR=1.80, p=0.254; analyses not shown). Both the comorbid and the non-comorbid groups were also at over 5 times greater relative risks of placement in the transition category of poor-to-good PSF. In contrast, neither the comorbidity or non-comorbid MIS groups were associated with the transition group of good-to-poor in the fully-adjusted model. Post-hoc tests using the good-to-poor PSF outcome as the reference group indicated that the non-comorbid MIS group was at greater risk of placement in both the persistently poor outcome category (RRR=4.94, p=0.002) as well as the poor-to-good transition category (RRR=4.19, p=0.004), compared to no identified MIS. The comorbidity group was at greater risk of placement in the transition outcome of poor-to-good PSF (RRR=3.29, p=0.009), relative to the good-to-poor group, but was not at greater risk of placement in the persistently poor PSF outcome category (RRR=2.20, p=0.072; analyses not shown).

None of the socio-demographic indicators were associated with any of the PSF trajectory groups. Compared to those reporting degree qualifications or above, those reporting no qualifications were at substantially lower relative risk of placement in the persistently poor, poor-to-good and good-to-poor PSF outcomes. Adverse employment conditions were associated with a two-fold greater relative risk of placement in the poor-to-good outcome, while low household income was associated with a two-fold elevated risk in placement in the good-to-poor PSF outcome. In contrast, benefits receipt was not associated with any of the PSF outcomes, and neither were perceived social support nor stressful life events.

Perceived health and functioning were the factors most strongly associated with persistently poor PSF over time. Specifically, MIS at follow up and high somatic symptom severity were associated with over 8 times higher relative risk of

placement in the persistently poor PSF group. Daily functioning problems and fair/poor self-rated health also demonstrated strong independent associations with persistently poor PSF. High somatic symptom severity and daily functioning problems were also robustly associated with transitions of both good-to-poor and poor-to-good PSF, although the associations were weaker than the association with persistently poor PSF. MIS at S2 were associated with greater risk of good-to-poor functioning outcome, while those reporting fair/poor self-rated health were not associated with any of the transition outcome categories.

Table 46 Fully-adjusted model of comorbidity and perceived social functioning trajectories from S1 to S2

| | **Good : good (n=710)** | **Poor : good (n=97)** | | **Good : poor (n=121)** | | **Poor : poor (n=115)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 5.62 (2.80-11.28) | <0.001 | 1.34 (0.57-3.18) | 0.502 | 6.65 (2.84-15.56) | <0.001 |
| MIS-physical comorbidity | 1.00 | 5.51 (2.37-12.82) | <0.001 | 1.68 (0.74-3.81) | 0.218 | 3.69 (1.49-9.14) | 0.005 |
| ***Female gender (S1)*** | 1.00 | 1.14 (0.64-2.03) | 0.647 | 1.48 (0.82-2.67) | 0.189 | 1.86 (0.96-3.60) | 0.065 |
| ***Age (continuous) (S1)*** | 1.00 | 1.02 (1.00-1.04) | 0.113 | 1.01 (0.99-1.03) | 0.431 | 1.03 (1.00-1.05) | 0.055 |
| ***Non-White ethnicity (S1 )*** | 1.00 | 0.61 (0.29-1.27) | 0.187 | 1.27 (0.64-2.49) | 0.490 | 1.45 (0.59-3.53) | 0.415 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.24 (0.53-2.92) | 0.622 | 1.45 (0.65-3.24) | 0.370 | 1.74 (0.59-5.17) | 0.315 |
| ≥10 years in the UK | 1.00 | 0.96 (0.43-2.15) | 0.929 | 1.05 (0.50-2.22) | 0.893 | 1.30 (0.55-3.10) | 0.550 |
| ***Education (S1+S2)*** | | | | | | | |
| No qualifications | 1.00 | 0.20 (0.05-0.71) | 0.013 | 0.36 (0.12-1.11) | 0.075 | 0.18 (0.05-0.57) | 0.004 |
| GCSE | 1.00 | 0.81 (0.37-1.79) | 0.601 | 1.30 (0.62-2.72) | 0.493 | 0.56 (0.19-1.67) | 0.297 |
| A-level | 1.00 | 1.36 (0.70-2.66) | 0.362 | 1.17 (0.58-2.36) | 0.668 | 1.15 (0.54-2.46) | 0.715 |
| Degree or above | | 1.00 | | 1.00 | | 1.00 | |
| ***Adverse employment conditions (S1+S2)*** | 1.00 | 2.15 (1.01-4.59) | 0.047 | 1.18 (0.57-2.45) | 0.662 | 1.63 (0.74-3.58) | 0.227 |
| ***Low household income (S1+S2)*** | 1.00 | 1.21 (0.58-2.54) | 0.607 | 1.99 (1.03-3.86) | 0.041 | 1.27 (0.57-2.83) | 0.556 |
| ***Benefits (S1+S2)*** | 1.00 | 1.42 (0.69-2.90) | 0.336 | 1.62 (0.86-3.06) | 0.135 | 1.80 (0.85-3.84) | 0.127 |
| ***High social support (S1)*** | 1.00 | 0.86 (0.37-1.99) | 0.726 | 0.54 (0.28-1.06) | 0.072 | 0.62 (0.28-1.41) | 0.255 |
| ***Stressful life events (S1+S2)*** | | | | | | | |
| 0-2 | | 1.00 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 1.53 (0.59-3.95) | 0.383 | 0.68 (0.32-1.43) | 0.312 | 1.30 (0.36-4.66) | 0.684 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 or more | 1.00 | 1.33 (0.50-3.52) | 0.562 | 0.87 (0.40-1.89) | 0.722 | 1.87 (0.54-6.52) | 0.324 |
| ***MIS (S2)*** | 1.00 | 2.00 (0.93-4.29) | 0.075 | 4.41 (2.33-8.34) | <0.001 | 8.03 (3.74-17.24) | <0.001 |
| ***Somatic symptom severity (S1+S2)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 1.58 (0.78-3.20) | 0.202 | 3.43 (1.76-6.70) | <0.001 | 2.35 (0.84-6.60) | 0.105 |
| High | 1.00 | 3.67 (1.61-8.35) | 0.002 | 3.02 (1.28-7.16) | 0.012 | 7.99 (2.78-22.95) | <0.001 |
| ***Fair/poor self-rated health (S1+S2)*** | 1.00 | 0.97 (0.47-2.02) | 0.937 | 1.31 (0.68-2.52) | 0.415 | 2.66 (1.26-5.62) | 0.010 |
| ***Daily functioning problems (S1+S2)*** | 1.00 | 3.30 (1.08-10.03) | 0.036 | 3.51 (1.20-10.23) | 0.022 | 5.73 (1.77-18.57) | 0.004 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms
"Good : good" represents the reference category in the multinomial regression.

## 5.5 Discussion

### 5.5.1 Summary of results

- 16.6% of the working age population of Southwark and Lambeth were persistently out of employment/education between S1 and S2. Another 17% were transitioning into or out of employment/education between the timepoints, suggesting unstable working conditions.
- A substantially greater proportion of persons reporting mental-physical comorbidity were represented in the persistent non-employment/education outcome group both compared to those reporting no MIS and non-comorbid MIS. Differences were smaller in the employment/education transition categories.
- 12.3% of the full S2 sample reported persistently poor PSF, while 65.9% reported continuously good PSF.
- Persistently poor PSF was disproportionately distributed by comorbidity: 39.9% reported persistently poor PSF among those reporting MIS-physical comorbidity, compared to 21.6% and 4.0% among those reporting non-comorbid MIS and no MIS. Differences in the PSF transitions were smaller.
- The unadjusted results supported the hypothesis. Compared to no MIS and non-comorbid MIS, the comorbidity group was at greater risk of placement in the outcome group of persistent non-employment/education, relative to stable employment/education. The comorbidity group was also at substantially greater risk of placement in the persistently poor PSF group, relative to continuously good PSF.
- There was limited support for the hypothesis after fully-adjusting for explanatory factors. The only hypothesized association remaining was the associations between comorbidity and persistently poor PSF, compared to no MIS. Comorbidity was not associated with greater relative risk of persistently poor PSF compared to non-comorbid MIS. Compared to no MIS and non-comorbid MIS, MIS-physical comorbidity was not associated with greater risk persistent non-employment/education, relative to stable employment/education.

- In both sets of analyses, the indicators of perceived health and functioning were the most influential explanatory factors. Somatic symptom severity and daily functioning limitations were strongly associated with persistently poor social functioning according to both outcomes, and MIS at follow-up were strongly associated with persistently poor PSF.
- In the fully adjusted model, MIS-physical comorbidity and non-comorbid MIS were also strongly associated with trajectories of poor-to-good functioning. Neither non-comorbid MIS nor comorbidity were associated with trajectories into or out of employment/education after adjustments.

### 5.5.2 Employment trajectories

16.6% of the working age population of Southwark and Lambeth were persistently out of employment/education between S1 and S2. Another 17% were transitioning into or out of employment/education between the timepoints, suggesting unstable working trajectories. A substantially greater proportion of persons reporting MIS-physical comorbidity were represented in the persistent non-employment/education outcome group both compared to those reporting no MIS and non-comorbid MIS, whilst differences were smaller in the transitioning employment/education categories.

Those who reported mental-physical comorbidity in S1 were six times more likely to be persistently out of employment/education compared to those with no reported MIS, and four times more likely compared to those reporting non-comorbid MIS. This suggests that whilst mental illness makes larger contributions to the burden of non-employment than physical illness, it is important to consider the additional contribution of comorbid physical illness. It also suggests that distinguishing persons with mental health problems in terms of physical comorbidity may be an effective way of targeting employment interventions.

Given that a minority of respondents were students in the employment/education groups at S1 and S2, few inferences can be made with respect to education trajectories, and focus will therefore be placed on employment.

#### 5.5.2.1 The impact of health on employment trajectories

It is noteworthy that neither non-comorbid MIS or MIS-physical comorbidity were associated with employment trajectories in the fully adjusted model. This is inconsistent with a large body of research evidencing the impact of mental and physical health on entering and exiting employment [452, 560, 562].

These inconsistencies may be explained by the comprehensive inclusion of explanatory factors of perceived health and functioning in the analyses of this chapter. The results indicated that the unadjusted health-selection effects were fully attenuated by accounting for perceptions of health and functioning. Perceived health and functioning also accounted for differences between the non-comorbid MIS and comorbidity. Specifically, the amplified burden of comorbidity appeared to be driven by the experience of somatic symptoms and functioning problems with daily living. This is consistent with research indicating that somatic symptoms such as pain and fatigue severely impair occupational functioning and are associated with exits from employment [583, 584], especially among workers with comorbid mental and physical health conditions [566, 585, 586]. The results from this chapter add to this literature, indicating that somatic symptoms not only drives those with comorbidity out of work, but also keeps them out of work. A potentially important factor contributing to these findings may be work-place discrimination, which is greater among those with mental-physical comorbidities, compared to those with non-comorbid illnesses [587].

In contrast, self-rated health was not associated with employment trajectories. This is inconsistent with previous research indicating that self-rated health has a significant impact on entering, maintaining and exiting employment [451, 560, 583].

Older age was associated with greater risk of persistent non-employment/education, in line with literature indicating increasing barriers to employment transitions and re-employment among those of older working age [561]. Women were also more likely to be persistently non-employed/not in education and transition into and out of employment/education. This finding was entirely explained by women being in caring roles, in line with national gender distributions of employment [588].

In contrast, ethnicity and migrant status were not associated with employment trajectories. This stands in contrast to research indicating significant employment barriers among ethnic minority groups and disadvantaged migrants [589, 590]. The findings are nevertheless consistent with other UK research which observed no influence of ethnicity on employment [591]. It is nevertheless important to acknowledge the other ways in which ethnic minority groups and migrants may be disadvantaged in terms of employment, which were not examined in this chapter. Notably, migrants and ethnic minority groups are more likely to be unsatisfied with their work, be in part-time employment, have more unsecure working conditions and undertake jobs which to not meet their qualifications [588, 590]. Furthermore, the financial returns from work are lower among ethnic minority groups [590]. Thus, employment inequities may take many different forms which may lead to poor health and exclusion among these vulnerable groups, and could be interesting for future research to explore in this sample.

#### 5.5.2.2 Social support and employment trajectories

Lower perceived social support and smaller social network size were associated with persistent non-employment/education as well as transitions into employment/education. The finding that it is associated with persistent non-employment/education is consistent with research suggesting social support facilitates re-employment [592]. However, the finding that poor availability of psychosocial resources was associated with greater risk of transitions into employment is inconsistent with this literature. Given that poor availability of psychosocial resources were associated with transitions into but not out of employment/education, this suggests that the indicators of psychosocial resources were influenced by employment conditions, rather than psychosocial resources influencing employment trajectories [593].

#### 5.5.2.3 Implications of non-employment among those with MIS-physical comorbidity

The persistent exclusion of 40% of working-aged persons with mental-physical comorbidities represents a disadvantage with important social and economic consequences. While certain aspects of employment may involve stressors that adversely affect health [594, 595], the advantages of employment are many and

tend to outweigh the disadvantages [318]. Notably, employment involves financial rewards and improves social mobility [596], and contributes to a sense of identity and self-worth [320]. Role fulfilment in education is also important as educational attainment this also has important influences health, but also determines future employment prospects [289].

Non-employment among those with comorbidities does not only imply missing out on the explicit and implicit benefits from work [319], but is also detrimental for health itself [597]. Furthermore, with longer time spent out of the workforce the health-selection effects are increasingly reinforced as re-employment steadily becomes less likely, while health continuously deteriorates [318, 555]. The findings in this chapter indicated that poor perceptions of health explained differences between the comorbidity group and both the no MIS and non-comorbid MIS groups. This suggests that exclusion from work may perpetuate poor health among those with comorbidities, increasingly making reemployment less likely, and steadily cementing the exclusion of this group from the workforce. Research also shows that the prospects of re-employment and the physical and psychological effects of job loss are particularly poor in the context of economic recession [598]. Within the macro-context of the current adverse economic climate, the findings of this chapter are particularly concerning, as the reinforcing effects of health, social disadvantage and exclusion from employment are likely to become amplified.

Over the life-course, this process of cumulative disadvantage is likely to increase socio-economic inequalities in mental health [32]. The added burden of physical illness may also lead to particularly poor economic prospects among those with mental-physical comorbidities. The unadjusted differences between the non-comorbid and the comorbid group were driven by poorer perceptions of health, pointing to existing burden of health which impacts on employment prospects among those with comorbidities. In terms of a life-course perspective the SELCoH study followed respondents over a relatively short period of time. It is thus likely that the employment inequalities would increase with time, between these groups.

### 5.5.3 Perceived social functioning trajectories

#### 5.5.3.1 The impact of health on social functioning trajectories

Non-comorbid MIS and MIS-physical comorbidity were both associated with persistent PSF impairment. Both groups were also associated with PSF improvements over time, in line with previous research [85, 575]. This may reflect an adaptation process where increasing acceptance may lead to lowered expectations of social functioning [599].

The unadjusted association indicated that the relative risk of persistently poor PSF was particularly strong for those reporting MIS-physical comorbidity, compared to those reporting non-comorbid MIS. This is consistent with research indicating that social functioning is especially impaired among those with mental-physical comorbidity [567, 579, 587]. The block-adjusted model of health-related factors suggest that these accounted for the differences in PSF by physical comorbidity, as the comorbidity group was no different from the non-comorbid MIS group after adjustments for perceived health and functioning. MIS at follow-up was the perceived health and functioning factor which contributed the most to the attenuation in the associations between comorbidity and persistent PSF impairment. This suggests that the persistence of mental illness symptoms plays an important role in persistently poor PSF, consistent with research indicating that the chronicity of mental illness is important in explaining PSF decrements [84, 575]. Alongside MIS at follow-up, high somatic symptom severity was the indicator most strongly associated with persistent PSF impairments in the fully adjusted model. The results suggest that symptoms such as fatigue, malaise, sleeping trouble, and various forms of pain are important barriers to social functioning, consistent with previous research [600, 601]. Daily functioning problems was also an important determinant of PSF, suggesting that physical functioning also played an important role in impairing PSF, in line with previous research [86].

The fact that MIS - with and without physical comorbidity - remained associated with substantially impaired PSF compared to those with no MIS in the fully adjusted model suggest that perceived health and functioning could not entirely explain the association between MIS and social functioning impairment. Mental illness stigma may provide a potential explanation and is discussed below in

terms of its impact, relevance with regards to chronicity and severity, and in the context of the “scarring” effect of mental illness on PSF.

#### 5.5.3.2 The potential impact of mental illness stigma

The stigma of mental illness could possibly explain why the non-comorbid MIS and MIS-physical comorbidity groups remained at elevated relative risk of persistent PSF impairment. Evidence suggests that persons with mental illness who perceive greater stigma are more likely to avoid social situations, socialise less outside of the family, and have fewer social contacts [602, 603]. This may be the result of internalised stigma and coping strategies to avoid anticipated discrimination and rejection [604, 605]. Internalised mental illness stigma also affects self-esteem and self-efficacy, and may thus impact on the confidence and perceived ability to engage socially outside the immediate social network [606], and is associated with greater social functioning impairments [603].

#### 5.5.3.3 The scarring effect of mental illness on social functioning

The finding that non-comorbid and comorbid MIS was associated with greater persistence of social functioning impairment, even after adjusting for MIS at follow-up, is consistent with previous research documenting a “scarring” effect of mental illness on social functioning, even after remission [607, 608]. Stigma may also be relevant with respect to this finding. Even though psychiatric symptoms may abate, it is possible that the past experience of mental illness causes self-stigma to persist. The proposition that internalised stigma explains the scarring effect of mental illness on social functioning impairment warrants further research. If the proposition were to be supported, it would suggest that it is important for services to address the social and psychological implications of mental illness in terms of stigma, in order to ensure full restoration of social functioning, and not simply focus on alleviating clinical symptoms.

#### 5.5.3.4 Socio-demographic and socio-economic findings

Contrary to previous research [591], the results from this chapter indicated that low education was associated with lower relative risk of persistently poor PSF. However, previous research tends to not make as comprehensive adjustments for perceived health and functioning as the analyses in this chapter did, which are likely to be poorer among those with low educational qualifications. The findings therefore suggest that independently of perceived health and

functioning, low education facilitates social functioning. In the context of the previous discussion, this could possibly indicate that more stigmatising views of mental illness are held among higher SES groups. However, contrary to this interpretation, the literature suggests that higher education is associated with less stigmatising attitudes, or that there is no association between them [609]. It is thus possible that expectations of social functioning in response to illness may be higher among groups with higher qualifications. This explanation may also account for the elevated risk of persistently poor PSF among women.

Aside from education, no other SES indicators were associated with persistently poor PSF. This is inconsistent with qualitative research indicating that low SES is impairs social functioning and inhibits seeking social support due to fear of burdening others in the social network who are also struggling, fear of the inability to reciprocate favours, and social occasions becoming stressful due to implicit costs [591]. The findings are nevertheless consistent with quantitative research observing no impact of persistent socio-economic disadvantage on social functioning [580].

Furthermore, important intersections between social statuses in terms of ethnicity, migrant status, gender, and age were observed. These findings are in line with other research indicating that the impact of health on social functioning varies by gender and ethnicity [591].

### 5.5.4 Limitations

There are a number of limitations with this research which ought to be raised. First, the analyses did not account for psychiatric comorbidity, chronicity or severity. These are factors that have previously been found to be associated with social functioning, and may have accounted for the residual effect of MIS on PSF [567, 607]. This limitation also applies to the employment trajectory analyses. Personality factors have also been found to be important determinants of social functioning and were also not accounted for in the current analyses [85].

With respect to the PSF analyses, the assessment of PSF trajectories did not measure perceptions of functioning change between S1 and S2. Instead, the same scale was used to assess PSF at two different timepoints. Given the subjective nature of the question, the changes may reflect relative rather than

absolute changes in PSF. Thus, adjustment processes and may alter expectations of PSF. The findings from the present research is nevertheless relevant, given that the perception of participation and social involvement is likely to be just as important for mental health than more objective measurements of social functioning, if not more so [550].

Furthermore, treatment for mental illness has been found to lead to social functioning improvements [572, 610], and was also not accounted for in the current research. Given that the results from Chapter 4 suggested that those reporting MIS-physical comorbidity made greater use of mental health services than the non-comorbid MIS group, this may have affected the results. Whilst measures of mental health service use were available, these are broader measures of service use which are likely to be more indicative of help-seeking behaviour than treatment receipt. In the absence of data which detailed quality, quantity and types of treatments, it was thus not possible to account for possible treatment effects.

Moreover, the fact that employment was assessed at two timepoints with two years apart allows for the possibility that multiple employment transitions could have taken place between these timepoints. Thus, those who were categorised into the groups of persistent non-employment/education or in continuously good employment/education may also have experienced transitions into or out of employment/education. However, compared to other survey research the follow-up period was relatively short. Nevertheless, future studies may consider following employment trajectories over multiple shorter intervals of time, to provide a more accurate description of employment trajectories. In addition, whilst employment has generally been conceptualised as something positive in these analyses, this may not necessarily be the case for persons with health problems [591]. This may be particularly important in the context of the current economic and political context where health benefits are being cut and back-to-work schemes are increasingly more coercively promoted, with adverse effects on mental health [611].

### 5.5.5 Conclusion

The results suggested that the burden of comorbidity in terms of poor perceived health and functioning drives people out of employment and also constitutes a

substantial barrier to re-employment. This burden also appeared to impair considerably those with comorbidity socially. Alongside persistent MIS, somatic symptoms were the perceived health and functioning indicator which accounted for the association between comorbidity and persistently poor PSF. This suggests that somatic symptoms may be as important to address in mental health services as psychiatric symptoms, especially for those with mental-physical comorbidities. Indeed addressing socially impairing symptoms – whether somatic or psychiatric – may address what matters to patients to patients the most.

Unmeasured social factors, such as internalised stigma, and/or clinical factors, such as MIS chronicity and severity, may explain the strong residual associations between MIS and persistently poor PSF. In order to restore social functioning it may thus be important to address the social and psychological implications of mental illness.

The reinforcing effects comorbidity and social functioning are likely to have cascading effects on inequalities, making an important contribution to cumulative disadvantage over the life course. The implications of the findings from this chapter highlight the importance of addressing this downward spiralling trajectory, not only to alleviate societal economic costs, but also as a matter of social justice.

# Chapter 6 Synthesis

## 6.1 Summary of main findings

In this thesis I applied a broad social epidemiological approach to understanding comorbidity using a representative South East London community sample. The aims of the thesis were:

1) to estimate the prevalence of comorbidity and describe inequalities in mental-physical comorbidity by key socio-demographic and socio-economic factors
2) to describe and explain the association between comorbidity and mental health service utilisation and quality
3) to describe the trajectories of social functioning by comorbidity

In Chapter 3 I found that mental-physical comorbidity was pervasive, affecting 1 in 6 of the general adult population of South East London. The prevalence of comorbidity increased with age, and was more common among women. The social distribution of comorbidity was characterised by distinct socio-economic inequalities. These were especially prominent among those reporting psychotic symptoms and physical comorbidity. Low household income was the socio-economic indicator most consistently associated with comorbidity. Few inequalities by ethnicity or migrant status were observed.

In Chapter 4 I explored the association between comorbidity and MHSU. While MHSU did not differ between the non-comorbid and the comorbid groups in the cross-sectional analyses, differences emerged over time such that persistent MHSU was greater for the comorbidity group. Perceived functioning limitations due to emotional health were a particularly important mediator of the association between comorbidity and persistent MHSU over time. This suggested that whilst those reporting mental-physical comorbidity use services more, they may not be benefiting from them.

In Chapter 5 I illustrated that comorbidity has important implications in terms of social exclusion. Nearly 40% of those reporting mental-physical comorbidity were persistently out of employment/education across both timepoints, and a similar proportion reported persistently poor perceived social functioning. These proportions stood in sharp contrast to the non-comorbid MIS group

where 14.7% were in persistent non-employment/education and 21.6% reported persistently poor social functioning. While differences in employment were explained by poorer health and functioning among those with comorbidity, the association between MIS and social functioning persisted after accounting for explanatory factors. Further, non-comorbid MIS were more strongly associated with persistently poor perceived social functioning compared to the comorbidity group. This suggested that the stigma of mental illness may represent an important socially impairing factor.

## 6.2 Theoretical implications

This thesis has shown that mental-physical comorbidity is associated with greater socio-economic disadvantage, greater social exclusion and poorer social functioning. The findings also suggest that those with co-occurring mental-physical illness, potentially as a result of this social disadvantage, are more likely to persistently use mental health services and might be less likely to benefit from them. The potential lack of benefit from mental health services as well as the persistent social exclusion is likely to contribute to the perpetuation of comorbidity and exacerbation of social inequalities in comorbidity. Thus, as mental and physical illnesses cluster, so does the absence resources to address them. As such, comorbidity may represent a process of cumulative disadvantage.

This interpretation is consistent with UK qualitative research of health-professionals serving deprived areas describing the management of multimorbidity as an “endless struggle” of interdependent social and medical problems precipitated the lack of material, personal and social resources [612]. Qualitative research from the US also supports this interpretation, conceptualising chronic illness, psychological problems, and social deprivation as a series of “cascading crises” [613] in interviews with low income patients. The findings from this thesis thus have important implications for conceptualisations of comorbidity, as well as health more broadly.

### 6.2.1 Conceptualisations of comorbidity

The current comorbidity literature is commonly limited by a dualistic approach to comorbidity with its roots in the biomedical compartmentalisation of mental of

physical health. Most research tends to focus on an index condition, whilst examining the impact of the separate “other” condition. These approaches to comorbidity have tended to be disease-disorder specific and focus on morbidity-driven mechanisms operating from one condition to the other. In adopting this type of approach, they often fail to consider the social context in which comorbidity occurs. This may represent a substantial oversight, as the results of this thesis have shown the important role that wider social factors may play in the genesis and maintenance of comorbidity.

Recent comorbidity research has started to direct attention to wider social factors such as stressful life events in childhood [e.g. 203]. Whilst this represents a step in the right direction, this research is nevertheless limited as childhood disadvantage is rarely conceptualised in the broader context of disadvantage, or in terms of setting trajectories of cumulative disadvantage throughout the life course.

With this thesis I have demonstrated the benefits of approaching comorbidity from a perspective of focusing on the commonalities of mental and chronic physical illness, in contrast to a disease-disorder specific approach to comorbidity. Whilst understanding disease-disorder specific mechanisms is important, especially in order to design targeted clinical interventions, the current state of the comorbidity literature lacks an understanding of the social context within which these mechanisms occur. Given that the social context is likely to affect multiple morbidity-driven mechanisms, it is crucial to complement the current literature with social epidemiological comorbidity research that extends our understanding of the wider social determinants of health to comorbidity. Instead of asking questions such as “what happens to cardiovascular disease when depression is comorbid” we need to start thinking in terms of what the wider health and social implications are when they co-occur.

### 6.2.2 Conceptualisations of health

The findings of the thesis also have wider implications for conceptualisations of health. The findings support what has previously been suggested, in that it is no longer meaningful to consider mental and physical health separately if we wish to gain an accurate understanding of the burden of illness [614]. As such, the

health concept used in research and policy needs to be redefined and move away from narrow focus on domain specific diagnoses [615], to a much broader perspective of health, considering how different aspects of health interact.

This shift would bring understandings of health more in line with how people with comorbidity experience health. Although, the biomedical legacy may encourage persons with comorbidity to separate their illnesses, the experience of health is nevertheless unitary. While a biopsychosocial approach to health has been promoted recently [614], the legacy of the biomedical understanding still permeates healthcare structures as well as lay and professional perceptions of health. This thesis contributes to evidence suggesting that a fundamental shift is needed with respect to perceptions of mental and physical health both in research and policy settings.

#### 6.2.2.1 Health as functioning

Some key findings of the thesis include the mediating effect of functional limitations due to emotional health in the association between comorbidity and MHSU, and the association between comorbidity and persistent social functioning limitations. These findings contribute towards a case of promoting a functional understanding of health. There are limitations with both negative definitions of health ("the absence of disease") [103], as well as positive definitions of such as that more recently promoted by the WHO, where health is conceived as "a state of complete physical, mental and social well-being" [p. 1, 616]. Importantly, these definitions do not consider the impact of recent medical and technological advances that allow people to lead enjoyable lives, despite having chronic physical conditions. In contrast, functional definitions of health place emphasis on the extent to which people are able to fulfil social roles [617], therefore adopting a more realistic dimensional approach to health.

An example of a functional definition of health may be "the ability to adapt and self-manage" [618] with respect to physical, mental and social aspects of health. This definition allows for the possibility of good health within the context of chronic mental or physical illness, unlike the positive or negative definitions of health. The results from this thesis support a conceptualisation of health where physical, mental and social domains are core features [618], given the findings

that poor mental and physical illnesses cluster with the experience of social disadvantage and that this has important implications for social functioning. A functional approach to health is also in line with the notion of “recovery” in psychiatry, referring to treatment approaches that strive for people to enjoy meaningful and productive lives, despite having a mental disorder [536].

A functional understanding of health is consistent with Sen’s capability approach of social inequality, where freedom constitutes the ability (capability) to be and do things that people value [207, 619]. In this framework, “functionings” represent a state of being, (such as “being healthy”) and contribute to overall capability [619]. To the extent that variations in capabilities imply variations in the extent to which people may pursue things that are valuable to them, it could be argued that health inequalities ought to capture the extent to which illness impairs overall capability, and not simply focus on morbidity or mortality. This places functioning at forefront of health, and arguably deserves greater attention from health inequality researchers, healthcare professionals, and policy makers [563].

#### 6.2.2.2 How resources matter in functioning

If it is accepted that functioning is central to the concept of health, then resources will also be relevant to health, given that resources also play a role in facilitating functioning [620]. This conceptualisation of resources as fundamental to health is at the very heart of the Fundamental Social Cause (FSC) theory [17, 248], which has been applied to understanding comorbidity in this thesis. The FSC postulates that social statuses indicate the availability of flexible resources that can be applied to prevent ill health and minimise its impact when it occurs. Although FSC has mostly been applied to morbidity and mortality, resources may be equally relevant to functional aspects of health.

Further, in the context of comorbidity, health constitutes a resource in itself. For example good mental health constitutes a resource for preventing and managing physical illness, and conversely good physical health facilitates promotes mental health and recovery from mental illness. However in the context of social disadvantage where resources are scarce, mental and physical resources are likely to be depleted, further increasing the risk of comorbidity.

This clustering of resources (or lack thereof) [621], may thus result in continuously depleted resources and comorbidity becoming increasingly more difficult to overcome. It is plausible that the social distributions of comorbidity presented in this thesis represents this process of cumulative disadvantage [622].

#### 6.2.2.3 Implications for health inequality research

As with the comorbidity literature, the health inequality literature to date has also been influenced by a biomedical separation of mental and physical illness and a compartmentalisation of conditions. Whilst the health inequality literature has long recognised that the social distributions of health to the disadvantage of vulnerable groups, this thesis has shown that the extent of health inequalities may have been underestimated: inequalities were greater when comorbid mental and physical illness was considered, compared to non-comorbid illness. This suggests that the distinction between comorbid and non-comorbid illness is meaningful, and should be applied more widely to document the extent of health inequalities.

The fact that resources tend to cluster [32] also suggests that comorbidity inequalities would benefit from being examined from an intersectional perspective. Research applying the FSC thus far, has mostly focused on single disadvantaged statuses separately without explicitly considering the implications of occupying multiple disadvantaged statuses. For example, given that the FSC theory was initially proposed in order to explain SES inequalities in health, most research has applied the theory to socio-economic inequalities in health [623], but also race and ethnicity [254], although no studies have tested the impact of cumulative disadvantage across different social statuses or multiple indicators of low socio-economic status. Based on the findings from this thesis, it is plausible that as social disadvantage accumulates over time or clusters according to multiple disadvantaged statuses, so does poor mental and physical health. This would be an interesting question for future research to explore.

## 6.3 Policy implications

### 6.3.1 The burden of comorbidity

The burden of mental-physical comorbidity has previously been acknowledged in terms of the healthcare use, financial costs and quality of life [13, 564]. The burden of comorbidity to health services in terms of utilisation has typically been estimated with an implicit assumption that poor mental health among those with physical illness causes increased uptake of general and specialist physical health services. However, Chapter 4 showed that physical comorbidity among those with mental illness also results in amplified use of mental health services. This suggests that the burden of co-occurring mental and physical illness places an amplified burden on mental as well physical health services. As such, without considering the impact of physical comorbidity on mental health service use, calculations of the comorbidity burden on healthcare may be underestimated.

The social distribution of mental-physical comorbidity described in this thesis also indicates that there are wider societal costs with respect to health inequalities. Specifically, if the previously outlined process of cumulative disadvantage accurately captures social trajectories of comorbidity, this implies that comorbidity inequalities are likely to increase over time. This might be particularly true within the current economic context, given that evidence suggests that health inequalities widen during recessions, especially in mental health [563]. The recent economic recession and the welfare reforms in the UK have been projected to have substantial impacts on health inequalities, especially in London [624]. Austerity taking a greater toll on the health and resources of the most vulnerable social groups is likely to make an important contribution to the increasing health inequalities during recessions [624]. This would suggest that the social consequences of the current economic climate will further precipitate the reciprocal effects of social adversity and poor health, making comorbidity even more challenging to overcome for the most vulnerable groups.

Thus, comorbidity is costly, both to society and health services, and the costs are likely to further increase with greater social inequalities. If comorbidity represents a process of cumulative disadvantage as described above, then

targeting the escalating trajectories of poor health and social exclusion becomes an important goal for policy. These are best addressed through social and healthcare interventions.

### 6.3.2 Suggestions for social interventions

From a public health perspective, it is important to address the social context in which comorbidities arise in order to effectively address the problem of escalating adversity and poor health. This demands a fundamental shift in focus from targeting the morbidity-driven comorbidity mechanisms to considering the underlying social causes by both researchers and policy makers [181].

Since the release of the Black report 1980, social policies have commonly been proposed as methods of addressing health inequalities in the UK. In the most recent health inequality report commissioned by the Government (Fair Society Healthy Lives), specific recommendations were made with respect to addressing inequalities in income and employment [213]. However, since the publication of the report in 2010, long-term unemployment has increased sharply, as have the proportion of households earning lower than the cost of healthy living [625]. Specifically, the proportion of London households receiving income that is insufficient to support the costs of healthy living has increased from a quarter to nearly a third [625].

The results from Chapter 3 indicated that low household income was the indicator most consistently associated with comorbidity. This suggests that it may be important to target material deprivation in order to address comorbidity inequalities in South East London. Implementation living wage policies, previously suggested as means of address health inequalities [624, 626] may thus be particularly relevant for reducing inequalities in mental-physical comorbidity.

However, 40% of those reporting mental-physical comorbidity were persistently out of employment, suggesting that welfare payments constitute the main source of income for this group. The situation for benefit recipients with comorbidity is also likely to have deteriorated with the recent changes to the welfare system which adversely affect the most vulnerable groups in society [627]. Revisions to these reforms have been proposed in order to address their

impact on the socio-economic health inequalities [624]. The results from this thesis suggest that it may also be important to consider comorbidity when estimating the impact of welfare reforms on health inequalities, in terms of cumulative disadvantage.

An alternative approach to addressing the adverse trajectories comorbidity may be to facilitate re-employment. However, the current back-to-work schemes for persons with mental illness are ineffective, and have been found to in fact make mental health problems worse [611]. The added vulnerability of those with mental-physical comorbidity also needs to be taken into account.

A "health-first" approach has recently been proposed to address health-related "worklessness" [626]. This approach emphasises collaboration between social and healthcare services in order to primarily improve health as a means of facilitating re-employment [626]. Indeed the intervention was found to improve mental and general health in particular, which appear to represent the most important barriers to re-employment among those with comorbidities (see Chapter 5). Thus, the "health-first" approach might be particularly relevant for addressing mental-physical comorbidity, especially since perceived health and functioning accounted for the differences between comorbidity and the no MIS and the non-comorbid MIS groups in terms of persistent non-employment/education.

In summary, policies addressing income, welfare, employment and may be effective in offsetting the downward spiralling social and health trajectories of comorbidity.

### 6.3.3 Suggestions for healthcare

#### 6.3.3.1 Primary care

Primary care constitutes a natural place to address comorbidity, given its generalist approach to care which involves attending to the whole person, rather than specific diseases [105, 115]. However, the disease- and disorder-focused state of current practice inhibits GPs from effectively treating comorbidity [615, 628]. Performance targets in the UK (the Quality Outcomes Framework, QOF) are structured according to a biomedical understanding of health which

separates conditions, without including targets to address the added burden of co-occurring illnesses [629–631].

The QOF also provides limited initiative for case-finding of mental illness [631]. Whilst there is limited evidence of "gaming" in order to gain better performance scores [631], the lack of incentive to identify mental illness is likely to leave many cases of mental-physical comorbidity undetected in primary care. In fact, the limited performance targets which explicitly rewarded case-finding of depression in CVD and diabetes were recently dropped from QOF according to changes to the General Medical Services (GMS) contract [632]. Revising the QOF performance targets to shift away from the disease-specific approach to care and incentivise monitoring and treatment of mental-physical comorbidity may thus present one method of addressing comorbidities in primary care.

Furthermore, the results of the research presented in this thesis indicated that somatic symptoms and perceived functioning limitations may represent important determinants of mental health service use. Focusing on addressing impairing symptoms (whether somatic or psychiatric), rather than symptoms of clinical severity, may thus be important for primary care services to consider. Functioning represents an important concern to patients with chronic disease [633], and improving functioning may therefore address patients' reasons for help-seeking and therefore alleviate the burden of comorbidities on service. Furthermore, developing performance targets that measure functioning and quality of life may also lead to increased patient satisfaction, beyond the achievement of clinical targets. In order to achieve improved social functioning, the results from this thesis suggest that it may be important to equip GPs with guidelines to address milder forms of mental illness.

The collaborative care model for managing diabetes and depression developed by Katon and colleagues [634] provide an example of a successful primary care intervention implementing a patient-centred approach to addressing comorbidity in primary care. The intervention allowed patients to work collaboratively with primary care professionals to set treatment goals. Individualised treatment goals were set in collaboration between patients and primary care physicians, while nurses monitored patient progress and actively supported self-care. As a result, mental and physical health outcomes improved, and quality of life and quality of care were rated with greater satisfaction [634].

#### 6.3.3.2 Secondary mental health care

A extensive literature indicates that psychiatric patients have up to 3 times greater risk of developing chronic physical conditions, and have 13-30 years shorter life expectancy than the general population, primarily due to premature mortality from chronic disease [3, 26, 50]. These stark health inequalities have increasingly become an important concern to secondary mental health services and policy makers [614, 635]. Interventions aimed at addressing physical health of patients in psychiatric services have typically targeted health behaviours in terms of smoking cessation support, exercise initiatives, and weight management [636]. Evidence suggests that such interventions can be effective in reducing risk factors of chronic disease [637]. However, interventions targeting modifiable risk factors are more likely to be effective if they consider the underlying reasons of poor health behaviours which are likely to be rooted in the context of social adversity [638]. Collaborations with social services to address barriers to maintaining physical health may thus prove effective in improving physical health outcomes [638]. To the extent that social adversity represents a fundamental social cause, such interventions may also have longer lasting effects as they are likely to address the fundamental problem, rather than superficially addressing a morbidity-driven mechanism, which is likely to be substituted by another [18].

Psychiatric patients often also experience barriers to physical health treatment [151]. Strengthening collaborations between psychiatric services and primary care may facilitate access to physical care and improve physical health outcomes among psychiatric patients [636]. For example, Druss and colleagues [639] developed a care management intervention for patients with SMI aimed at overcoming patient, provider and system barriers to physical healthcare (primary care, access, referral and evaluation (PCARE)). A randomised control trial of the PCARE randomly allocated patients attending community mental health services to the intervention. Nurses acted as care managers and used psychological interventions, action plans and goal setting in order to facilitate access to care. The intervention also offered practical support such as transport. The outcome of the trial indicated that PCARE was effective in

improving uptake of preventative services, clinical outcomes as well as quality of life [639].

As illustrated in by the successful outcome of PCARE, primary care may have a particularly important role in monitoring and managing risk factors of chronic diseases among patients with SMI. Although QOF includes such monitoring targets, many of these were dropped with the most recent changes to QOF with the 2014/2015 GMS contract [640] (e.g. monitoring cholesterol levels).

#### 6.3.3.3 Secondary physical health services

As well as physical health problems being common among psychiatric patients, mental health problems are highly prevalent and very costly in hospital settings. It is estimated that psychiatric comorbidity contribute additional costs amounting to 15% of hospitals' the total expenditure [641]. Liaison psychiatry has proven to be an cost-effective way of addressing mental-physical comorbidity in these settings by integrating mental health specialists into the services [13, 642]**.** The Rapid, Assessment, Interface and Discharge (RAID) model developed by Birmingham City Hospital is an example of an innovative liaison psychiatry approach which has proved to be particularly effective. The RAID model ensures the provision of timely mental health assessment by an interdisciplinary team composed of various mental health specialists as well as social workers. The RAID model has been evaluated as very successful in terms of improving physical health outcomes, preventing readmission as well as reducing costs [643]. Addressing the mental health and social needs of patients presenting to hospital quickly is likely to benefit vulnerable patients and the RAID model may thus be effective in reducing comorbidity inequalities.

The 3 Dimensions for Diabetes (3DFD) project at King's College Hospital provides a further example of how physical, mental, and social needs may be successfully addressed in specialist physical care settings [644]. A pilot of the 3DFD project aimed to improve clinical outcomes and psychological functioning of patients with diabetes presenting with poor glycaemic control. The interdisciplinary intervention offered support for mental health needs from a liaison psychiatrist and clinical psychologist, but also integrated third sector

parties to address social needs (e.g. debt management, employment). The pilot indicated improved clinical outcomes and high patient satisfaction [645].

The Integrating Mental & Physical healthcare: Research Training and Services (IMPARTS) programme developed by King's College Health Partners illustrates how mental healthcare can be integrated into physical healthcare services in order to address milder as well as more severe forms of mental illness across a range of physical healthcare services [646]. IMPARTS offers a web-based screening tool for mental health problems among patients attending specialist physical health services. The service development tool aims to integrate mental health screening into routine care in order to improve the identification of mental illness and distress, and monitor its impact on physical health. The screening tool also allows for referral pathways to be identified in order to ensure receipt of appropriate treatment. IMPARTS represents a general approach to monitoring and facilitating access to mental healthcare among those with physical illness, which has now successfully been implemented in multiple secondary physical healthcare settings [646], although its effectiveness in terms of cost and clinical outcomes remains to be evaluated.

#### 6.3.3.4 A case for integrated care

The care models outlined above provide good examples of how collaborative care may be successful when services across different sectors extend into one another. Whilst these models have proved effective, the currently fragmented healthcare structures present fundamental barriers for optimal management of mental-physical comorbidity. An important distinction exists between "integrated" and "collaborative" care, although the terms are often used interchangeably to refer to interdisciplinary care models [647]. Collaborative care indicates that healthcare professionals work together across disciplines, but not under the same organisational framework [647]. Structural changes will be necessary in order to achieve integrated care under a single organisational framework. Recently proposed models of integrated health and social care [648] could provide structural changes to the healthcare system which may facilitate addressing mental-physical comorbidities with integrative care models.

Until such change is implemented it is important to identify who is responsible for monitoring the comorbidity status of patients in the current compartmentalised healthcare system, in order to effectively address mental-physical comorbidity. The holistic approach to health promoted in primary care suggests that GPs may be appropriate for this task. In order to achieve this, monitoring and attending to the comorbidity status of patients could be incentivised using QOF.

#### 6.3.3.5 Implications of existing comorbidity inequalities for future interventions and policy

This thesis has described a social distribution of comorbidity which has implications for shaping future policies and interventions to address comorbidity. Specifically, the FSC proposes that health inequalities are in part explained by flexible resources facilitating access healthcare services, such that they are accessed sooner and provide greater benefits [18]. For example, self-management interventions currently constitute popular methods of addressing comorbidity [13]. However, these are likely to be more successful where flexible resources such as social support and health literacy are available. Thus, without considering the role of social statuses and the availability of resources it is possible that inequalities in comorbidity may inadvertently increase, even if absolute levels of comorbidity decrease [623]. As such, the aspect of cumulative disadvantage of comorbidity would not be adequately addressed, as the most vulnerable with comorbidities would be likely to continue along the trajectories of social disadvantage and poorer health.

Interventions must therefore be designed with the social situation of the most vulnerable groups in mind in order to ensure that inequalities in comorbidity do not increase as a result of the intervention [623]. This might involve allocating intervention resources disproportionately, such that all patients have an equal chance of benefiting from the intervention. The care models of PCARE, RAID and 3DFD are examples of interventions that are likely to improve comorbidity inequalities rather than the contrary, as they incorporate ways addressing social vulnerability.

## 6.4 Strengths and limitations

### 6.4.1 Limitations

#### 6.4.1.1 The issue of social causation and social selection

In this thesis I have taken the theoretical stance that health inequalities are driven by social circumstances in terms of the differential exposure to adversity and the disproportionate availability of resources. However, health also influences the possibility to attain social status [552]. This represents the pertinent social causality *vs* social selection debate within the health inequality literature [238, 649], which has been particularly relevant to inequalities in mental health [249].

Although a theoretical emphasis has been placed on social causation, health causations and selection processes continuously take place throughout the life course [249]. Social selection also plays a part in the process of cumulative disadvantage [650], which has been used as an explanatory framework to explain the findings of this thesis. Specifically, Chapter 5 described how comorbidity was associated with trajectories of persistent non-employment/education over time, thus illustrating how social selection effects may contribute to comorbidity inequalities over time. The fundamental role that resources are likely to constitute in health inequalities nevertheless suggests that social disadvantage is driving the cumulative trajectories, rather than health.

Given that the analyses in Chapter 3 were cross-sectional, it is theoretically possible that the observed comorbidity inequalities were driven by social selection. It is plausible that comorbidity presents greater challenges to attaining social status, than non-comorbid illnesses do, as the analyses in Chapter 5 indicated. However, longitudinal empirical evidence supports a case of social causation playing a greater role in mental health inequalities over social selection, especially in CMDs which were the most prevalent mental illnesses in the general population [651, 652]. It is nevertheless the case that the analyses examining comorbidity inequalities in Chapter 3 were cross-sectional. Therefore it is not possible to make inferences regarding causation based on the research presented in this thesis. Longitudinal evidence, ideally over multiple timepoints, would benecessary to confirm the dominant role of social causation over social

selection in comorbidity inequalities. Using a life course approach to explore the interplay between social causality and social selection mechanisms in relation to comorbidity would be a relevant topic for future work [180].

#### 6.4.1.2 Limitations with the study design and sample

Whilst the current study provides an in–depth description of comorbidity and its social distribution and association with mental health service uptake in South East London, the findings are not necessarily generalisable to beyond inner-city London. It is therefore not possible to comment on the social distribution of comorbidity or its impact on mental health services outside of London, based on the findings presented in the thesis. However, the demographic diversity in the UK creates variations in health needs, which calls for locally tailored services to address them [653]. Thus, whilst the findings need to be replicated on a wider scale, this research nevertheless makes important contributions to local services.

The SELCoH dataset contains rich detail of socio-demographic and socio-economic statuses. For example, compared to national datasets, it contains greater numbers of often under-represented groups such as ethnic minorities [52]. Despite this, there are still limitations in terms of sample size, particularly with regards to ethnicity. This was especially true with respect to testing intersectional effects on comorbidity, as sample size did not permit interaction tests to be performed. This represents an important limitation with the study, given that statuses often intersect to produce amplifying risk effects or protective effects on health. Adopting an intersectional analytical approach may have produced more nuanced findings, especially with regards to ethnicity and migrant status.

Stratification may have been an alternative analytical approach to examining intersectional effects in the current research. Recent research from SELCoH using this method has revealed important intersectional effects with respect to health and service inequalities by ethnicity and migration [258]. However, this research was published at a stage when it was too late to inform the analyses of this thesis.

#### 6.4.1.3 Limitations with measures of socio-economic status

Although the SELCoH surveys permitted a wide range of socio-economic indicators to be examined in this thesis, social class represents an important measure of social standing which was not possible to examine in relation to comorbidity. Beyond individual SES, neighbourhood factors have also increasingly been recognised as having important influences on health [324], and evidence suggests that neighbourhood deprivation may constitute a risk of mental-physical comorbidity [337]. Whilst the Indices of Multiple Deprivation (IMD) provide freely available deprivation measures in England for relatively small geographical areas [654], the geographical units were methodologically problematic to use for the purposes of this project. The geographical units of lower super output areas (LSOAs) used for the IMD are not designed for research purposes, but for electoral purposes. As a result there may be socio-economic heterogeneity masking inequalities when aggregated measures at the LSOA-level are used. This may be especially true in an area like South East London which is characterised by substantial socio-economic diversity. Moreover, preliminary analyses indicated that the SELCoH data did not support multilevel analyses to examine the impact of neighbourhood deprivation on comorbidity.

This is an important limitation as societal inequalities may contribute to comorbidity, and thus remains an aspect of socio-economic disadvantage which this thesis was unable to explore. This research question may be more suitable to explore in larger datasets, with measures specifically designed for capturing area-level deprivation for the purposes of measuring area-level inequalities.

#### 6.4.1.4 Potential limitations with health measures

With respect to the mental health measures, it was not possible to account for psychiatric severity as an explanatory factor in the analyses. Although a measure of psychiatric comorbidity may have been produced by examining the co-occurrence of CMDS and PS, this would have raised collinearity issues with regards to the non-comorbid physical and no identified illness groups. Nevertheless, psychiatric severity may represent an important factor which may have explained some of the observed differences between non-comorbid mental illness and mental-physical comorbidity presented in this thesis.

Although this thesis adopted an encompassing conceptualisation of mental health, substance dependence disorders represent mental health problems that were not considered. Substance dependence may be particularly relevant to comorbidity as they may act as a morbidity-driven mechanism between mental and physical health. It may also be relevant to the aspect of cumulative disadvantage, as these disorders, especially in the case of illicit substance use, are characterised by additional stigmas of crime and immorality, with important implications for social exclusion [655]. It was beyond the scope of this thesis to explore the role of substance use in the association social disadvantage and comorbidity, but might be an interesting question for future research to address.

As previously outlined in Chapter 3 (section 3.7.4), the self-reported physical illness measures may have given rise to measurement bias. However, evidence suggests that bias arising from such self-report measures is minimal in estimations of mental-physical comorbidity [484].

#### 6.4.1.5 The limited examination of morbidity-driven mechanisms

This study provided a social epidemiological description of mental-physical comorbidity, proposing that social disadvantage fundamentally leads to comorbidity by influencing morbidity-driven mechanisms. Whilst several potential morbidity-driven mechanisms were considered (e.g. health behaviours, perceptions of health), I could merely speculate around the potential role of other mechanisms such as health literacy, and personal senses of control and mastery. Furthermore, the study was unable to provide any insight into the how social disadvantage affects the biological mechanisms comorbidity. Although morbidity-driven mechanisms of comorbidity have been extensively researched before, it may be fruitful to combine this type of research with the social epidemiological approach presented in this thesis in order to understand how social disadvantage impacts on such mechanisms. This might provide an important development to the understanding of how social disadvantage translates into comorbidity.

#### 6.4.1.6 Limitations with measures of service use

There are a number of limitations with the mental health service use (MHSU) measures applied in Chapter 4 which ought to be acknowledged. First, a broad conceptualisation of mental health service use (MHSU) was applied in analyses

of Chapter 4. As outlined in section 4.8.6, this measure of self-reported MHSU is likely to reflect help-seeking behaviour, rather than actual treatment receipt. Furthermore, although a distinction was made between primary and secondary MHSU, specific mental health treatments were not examined. In addition, the quality measures at primary care practice level may have been too crude to capture variations in quality by comorbidity. Different results may have been found if individual-level measures of quality had been available. Linking health records to the SELCoH survey data might be one way to examine differences in mental health care quality at the individual level, and may be worth exploring in future research. Finally, physical healthcare utilisation or quality was not examined with respect to comorbidity in this thesis. Although these associations have been extensively documented in the literature previously, a comprehensive local understanding of the impact of comorbidity on health services in South East London would have benefitted from examining associations between comorbidity on physical healthcare in addition to mental healthcare.

#### 6.4.1.7 Multiple comparisons

The thesis addressed 3 aims with numerous hypotheses and multiple comparisons. Whilst each hypothesis and test was theoretically driven, it is potentially problematic to perform multiple inferential statistical tests. This is because the likelihood of observing a statistically significant result by chance increases with each inferential test (false positive or Type I error). This problem is sometimes addressed by using Bonferroni corrections. These adjust the statistical significance level such that it becomes more conservative in accordance with the number of comparisons. However, p-values are heavily influenced by sample size, and given that the analyses in the thesis often involved groups with small cell sizes, it is likely that many true differences would not be captured with the application of Bonferroni corrections (false negatives or Type II errors). It was therefore decided not apply these types of adjustments, but instead cautiously interpret significant findings, and place greater weight on the strength of the associations and consistent results patters, rather than p-values. For example, the fact that the major SES indicators of theoretical relevance (education, employment and income) were associated with

comorbidity after adjustments, point towards true socio-economic differences in comorbidity, rather than chance findings.

### 6.4.2 Strengths

#### 6.4.2.1 Originality

An important strength of this thesis lies in its originality. The research presented contributes to a limited body of literature applying a health inequality perspective to comorbidity, and is the first to apply the approach of the FSC theory. This represents a novel conceptualisation of comorbidity, and broadens the bidirectional understanding of comorbidity by placing emphasis on the fundamental role of social circumstances and cumulative disadvantage.

#### 6.4.2.2 Strengths of the study design and sample

Further strengths of the research presented in this thesis are inherent to the study design and sample. The use of a representative community sample from South East London provided a local understanding of health inequalities and the demands for services within the area. This constitutes an important source of information for healthcare providers and local policy makers [52]. Beyond the immediate local area, the use of a representative sample suggests that the findings are likely to be generalisable to other urban population samples, although replication is necessary.

The diversity of the population in terms of ethnicity, migration status and SES allowed for a detailed description of comorbidity inequalities by a broad range of vulnerable social statuses. This represents an important advancement in the literature, since most research to date has either focused on comorbidity inequalities by one or a limited number of vulnerable social statuses. Although small cell sizes of specific ethnic groups in certain analyses did not allow for disaggregating ethnic minority groups, the results nevertheless point towards the importance of examining multiple ethnic groups separately. For example, the analyses indicated that Black African ethnicity not associated with PS-physical comorbidity while Black Caribbean ethnic groups were at greater risk of PS-physical comorbidity. These findings illustrate the importance of

disaggregating Black ethnic minority groups, which are often treated homogenously in epidemiological research.

Furthermore, the longitudinal study design provided an understanding of the impact of comorbidity over time. The relatively short follow-up period and the high retention (73.1%) also allowed for longitudinal inferences to be made with relatively high certainty. In addition, the context of the economic recession offered a unique opportunity to study the impact of particularly adverse socio-economic circumstances on comorbidities.

Finally, the use of a community, rather than patient, sample represented an important advantage in terms of providing an accurate description of comorbidity inequalities in the general population. Specifically, patient samples may under-estimate the extent of comorbidity inequalities, by not accurately capturing milder forms of mental illness, which nevertheless have important implications on functioning.

#### 6.4.2.3 Strengths of the measures of socio-economic status

Notwithstanding the limitations with the SES measures outlined in 6.4.1.2, the SELCoH datasets allowed for a comprehensive inclusion of a broad range of SES measures. This enabled me to provide the most detailed description of socio-economic inequalities in mental-physical comorbidity to date. The wide range of SES indicators allowed for an in depth understanding of the types of resources which are likely to be important in the genesis and perpetuation of comorbidity. In identifying low household income as the indicator most consistently associated with comorbidity, this provided a specific target for social intervention.

#### 6.4.2.4 Strengths of the health measures

Strengths of the mental health measures include the use of validated screens to capture symptoms indicative of a wide range of common mental disorders (CMD) with the CIS-R, and psychotic symptoms with the PSQ. This enabled examination of both CMD- and SMI-physical comorbidity within a community

population, setting this thesis apart from previous research on mental-physical comorbidity inequalities.

## 6.5 Directions for future research

### 6.5.1 Stigma

The identification of deviant characteristics in combination with negative evaluations, describes the process of labelling [656]. Stigma is a common social consequence of labelling. Stigma in relation to health refers to the labelling, stereotyping, separation, status loss and discrimination due a particular health condition [657]. Although labelling and stigma are relevant to both mental and physical illnesses, it has been raised as a particularly important factor in the perpetuation of mental illness [656]. Internalised stigma of mental illness has adverse effects on self-esteem and social functioning, which in turn have important interpersonal consequences affecting employment, social networks and help-seeking. Stigma may lead to barriers to care arising from interpersonal and structural discrimination [658, 659], and may also cause social isolation due to feelings of shame and guilt. These barriers to care and processes of social exclusion thus reinforce the vulnerability to mental illness, and increase the risk of physical illness [27, 151, 604]. Stigma also undermines the availability of resources, thus fundamentally underlying health inequalities in similar ways that processes of socio-economic stratification do [18, 660]. As such, labelling and mental illness stigma may make important contributions to the downward spiralling trajectories of social disadvantage and poor health in comorbidity.

Exploring the role of stigma in comorbidity thus constitutes a relevant topic for future research. A possible research question might be: *“Does stigma contribute to downward spiralling trajectories of social disadvantage and poor health?”* Specific research objectives addressing such a question may include:

- To explore how mental-physical comorbidity affects helps-seeking for mental and physical health problems.
- To explore how stigma of mental and physical illness impairs social and occupational functioning.
- To explore how potential functioning impairment resulting from stigma affects mental and physical health.

- To explore how stigma and comorbidity affects processes of illness adaptation.

A mixed-methods approach could be adopted in order to address the above outlined research objectives. SELCoH has now achieved a third wave of data collection, following up participants. It is therefore possible to quantitatively examine how questions regarding stigma measured in wave 2 might influence health, functioning and service use outcomes in wave 3. Many SELCoH participants have also provided their consent to be re-contacted for research purposes. Qualitative data analysis using in-depth interviews with purposefully selected SELCoH participants could therefore provide richer detail on stigma and its impact on social circumstances and health.

### 6.5.2 An intersectional approach to comorbidity

The results from this thesis suggest that previous research separately examining inequalities in mental and physical conditions may have underestimated the extent of health inequalities by not considering the impact of comorbidity. Similarly, others have suggested that health inequalities have been underestimated due to a lack of consideration of intersectional effects by social statuses [661]. Whilst an intersectional approach constituted a core feature of the theoretical framework applied in this thesis, I was unable to explicitly test intersectional effects on comorbidity due to restrictions of sample size. However, combining the study of clustering social disadvantage (intersectionality) with the clustering of poor health (comorbidity) may present an innovative approach to comprehensively understanding health inequalities. For example, an intersectional approach to comorbidity may reveal differences in returns from resources by social statuses and provide a more comprehensive understanding of how resources affect comorbidity.

A specific research questions might be: *"Is comorbidity associated with clusters of socially disadvantaged statuses?"* Specific objectives could include:

- To explore how mental-physical comorbidity is distributed according to clusters of social disadvantage.
- To describe variations in typologies of social disadvantage between an inner-city population and the national population, and explore which typologies are particularly affected by comorbidity.

- To examine whether resources according to certain advantaged social statuses offer fewer health returns in terms of comorbidity in the context of other disadvantaged statuses.

Using the SELCoH sample, a structural equation approach could be used in order to identify typologies of social disadvantage, and their associations with comorbidity. Reducing multiple variables into typologies of status groups using latent class techniques could possibly produce more nuanced findings with respect to ethnicity, migrant status and SES. Using the structural equation approach outlined above, a comparative analysis could be performed to address this question, using a national sample (Adult Psychiatric Morbidity Survey).

A separate dataset with a larger sample size could be used in order to address the final objective. Interaction tests may, for example, explore health returns in terms of comorbidity between ethnic groups at various levels of SES. Collaborations with other research groups, for example in the US, may be necessary in order gain access to datasets including sufficiently large sample sizes of minority groups to secure the statistical power to test for interactions.

### 6.5.3 A life course approach to comorbidity

Should comorbidity represent a process of cumulative disadvantage, then comorbidity inequalities ought to become more prominent across the course of life. A specific research question might be: *"Does mental-physical comorbidity reflect a process of cumulative disadvantage?"* The objectives may include:

- To explore how socio-economic differences in mental-physical comorbidity change over the life-course.
- To examine intersectional effects on socio-economic trajectories across the life-course, for example according to migrant status.

The use of a large population birth cohort could provide a suitable research design to address these objectives. Exploring the role of mutually reinforcing processes of health decline and accumulating social disadvantage in mental-physical comorbidity could be statistically tested using multi-level regression models.

### 6.5.4 Methodological advancements of comorbidity and healthcare research

The impact of comorbidity on healthcare has extensively been studied, but the current state of the literature is limited in its near-exclusive focus on physical healthcare use. The analyses presented in Chapter 4 advance this field of research, but there is nevertheless scope to further build on these findings in order to understand the impact of comorbidity on mental health services. For example, there were important limitations with the quality measures applied in this study, and it be relevant further to examine quality of mental health care among those with mental-physical comorbidity with alternative measures. It may also be important to examine the differential benefits from mental health treatments according to physical comorbidity and social statuses, and identify barriers to benefiting from healthcare in terms of treatment outcomes.

More generally, methodological developments are necessary in order to advance the comorbidity and healthcare literature beyond current understandings. While it is well established that comorbidity places a great impact on services, seeking to understand why would be relevant in order to be able to address the increasing burden of comorbidity. Inequities in quality of care and treatment outcomes may thus also be explored in service beyond mental healthcare.

A specific research question might ask: "*Why does mental-physical comorbidity place a greater impact on services compared to non-comorbid conditions?"* Specific objectives might include:

- To explore how mental-physical comorbidity in the context of social disadvantage affects service quality and treatment outcomes.
- To examine whether poor quality and treatment outcomes contribute to greater service utilisation and costs incurred by medically and socially complex patient groups characterised by comorbidity and social disadvantage.

Mixed-methods designs and record-linkage methods would constitute innovative approaches to addressing the above outlined objectives. This could be achieved using the SELCoH dataset and electronic health records from local service providers. SELCoH now contains 3 waves of data, and the consent and

infrastructure exists such that it would be possible to link these with primary care records in Lambeth (Datanet) and secondary mental health records from the South London Maudsley NHS Foundation Trust (the Clinical Records Interactive Search (CRIS) System). It may also be possible to link these datasets with hospital records, providing a comprehensive understanding of service utilisation and costs. Waves 1 and 3 of SELCoH also include anthropometric measures and medications, which could contribute to measures of treatment receipt and outcomes. Physical comorbidity with CMDs as well as SMIs could be explored, using information from both SELCoH and the electronic records.

Analyses could take place at 3 levels: macro, meso and micro. Macro analyses could make use of area-level deprivation measures and individual-level ethnicity data from the primary care dataset (Datanet), using longitudinal regression analyses to address the objectives. Linkages between Datanet and secondary mental and physical health records could provide necessary measures to accurately estimate economic costs. Meso-level analyses could use the SELCoH-Datanet linkage to address the objectives in richer detail in a smaller sample using quantitative longitudinal analyses. Indicators of social disadvantage could include ethnicity, migrant status and multiple individual-level measures of SES. The linked dataset would also enable comparisons to persons not using services. Micro-level analyses might involve follow-up interviews with a sub-sample of SELCoH participants to triangulate the quantitative findings. Interviews may for example explore the role of social resources in service use and illness recovery.

## 6.6 Conclusion

This thesis has demonstrated that comorbidity is associated with important socio-economic inequalities, increased mental health service use, and persistent social exclusion. The findings suggest that comorbidity may reflect a process of cumulative disadvantage, which could have important implications for conceptualisations of comorbidity, health and health inequalities.

Considering the increasing prevalence of chronic conditions [662] and the implications of the current economic climate, mental-physical comorbidity is

likely to become an increasingly more pressing issue for public health to address. Altering the courses of the downward spiralling trajectories of health and social disadvantage among those with mental-physical comorbidity is thus of great importance from both an economic point of view, as well as a matter of social justice. Healthcare models of integrated care have the potential to effectively address mental-physical comorbidity in services, while interventions directed at reducing social inequalities are important both in terms of preventing comorbidity and interrupting its downward spiralling course of disadvantage.

## List of main abbreviations

| | |
|---|---|
| CATI | Computer-assisted telephone interview |
| CI | Confidence interval |
| CIS-R | Revised Clinical Interview Schedule |
| CMD | Common mental disorder |
| CMDS | Common mental disorder symptoms |
| FSC | Fundamental Social Cause (theory) |
| GP | General practionioner |
| MHSU | Mental health service use |
| MIS | Mental illness symptoms |
| NHS | National Health Service |
| OCD | Obsessive compulsive disorder |
| PHQ | Patient Health Questionnaire somatic symptom severity scale |
| PSQ | Psychotic Screening Questionnaire |
| PS | Psychotic symptoms |
| PSF | Perceived social functioning |
| QOF | Quality outcomes framework |
| RRR | Relative risk ratio |
| S1 / S2 | South East London Community Survey (Phase 1 / 2) dataset/sample |
| S1+S2 | Variable composed using data from both Phases of the South East London Community Surveys |
| SELCoH 1 / 2 | South East London Community Survey (Phase 1 / 2) |
| SES | Socio-economic status |
| SMI | Severe mental illness |

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# Appendices

## Appendix A

Table A1 Comparisons of SELCoH samples with available UK census information

| | UK Census for the SELCoH study catchment area[a] | | | | SELCoH study samples | | | |
|---|---|---|---|---|---|---|---|---|
| | 2001 | | 2011 | | Phase 1 | | Phase 2 | |
| | n | (%) | n | (%) | n | (%) | n | (%) |
| **Total samples[b]** | N=511035 | | N=591369 | | N=1698 | | N=1052 | |
| **Gender** | | | | | | | | |
| Female | 260066 | 50.9 | 297830 | 50.4 | 959 | 56.5 | 615 | 58.5 |
| Male | 250969 | 49.1 | 293539 | 49.6 | 739 | 43.5 | 437 | 41.5 |
| **Ethnic group** | | | | | | | | |
| White | 320377 | 62.7 | 329374 | 55.7 | 1051 | 63.4 | 680 | 64.6 |
| Mixed[c] | 22014 | 4.3 | 40938 | 6.9 | --- | | 41 | 3.9 |
| Black-Caribbean | 51694 | 9.9 | 46860 | 7.9 | 143 | 8.7 | 50 | 4.8 |
| Black-African | 70186 | 7.3 | 82600 | 14.0 | 234 | 13.2 | 110 | 10.5 |
| Asian or Asian British | 22105 | 4.3 | 35483 | 6.0 | 63 | 3.5 | 55 | 5.2 |
| Other | 36593 | 7.2 | 56114 | 9.5 | 205 | 11.2 | 116 | 11.0 |
| **Age groups** | | | | | | | | |
| 16-29 | 129290 | 32.6 | 156643 | 32.3 | 577 | 34.0 | 244 | 23.2 |
| 30-59 | 200387 | 50.5 | 262958 | 54.2 | 876 | 51.6 | 616 | 58.6 |
| 60+ | 66770 | 16.8 | 65474 | 13.5 | 244 | 14.4 | 192 | 18.3 |
| **Economically active[d]** | 265546 | 68.5 | 347049 | 75.1 | 1125 | 69.5 | 734 | 69.8 |
| **Economically inactive[e]** | 121919 | 31.5 | 115232 | 24.9 | 494 | 30.5 | 317 | 30.2 |

[a] South east London Boroughs of Lambeth and Southwark; data are provided by the UK Office for National Statistics

[b] Census sample are age16 to 74 years and SELCoH sample are age 16 to 90; Frequencies may not add up to 100% due to missing values; percentages are unweighted

[c] Mixed ethnicity not specified as a category in the SELCoH study and are included in the Other ethnic category

[d] Economically active includes: Full time work, Part time work, Casual work, Unemployed, and Working Students

[e] Economically inactive includes: Student, Permanent sick/disabled, Temporary sick, Retired, Looking after the home children

Source: adapted table from Hatch et al [51] and Morgan et al [446].

Table A2 Specified “other” longstanding illnesses: raw data within derived categories

| | | n |
|---|---|---|
| **Neoplasms** | | |
| BRAIN TUMOR | | 1 |
| LUMP IN THROAT, OP IS IN FOUR DAYS TO SEE IN CANCER | | 1 |
| MASECTOMY | | 1 |
| MIOMAS | | 1 |
| PSA (PROSTRATE) | | 1 |
| luchaemia | | 1 |
| | *Total* | 6 |
| **Neurological problems** | | |
| AMAUROSIS FUGAX | | 1 |
| BLIND IN ONE EYE | | 1 |
| CARPEL TUNNEL SYNDROME | | 1 |
| CATARACT | | 1 |
| CFS | | 1 |
| DEAF IN ONE EAR | | 1 |
| EYE CONDITION | | 1 |
| EYE CONDITION CORNEAL TRANSPLANT AND GLAUCOMA | | 1 |
| Fredericks Ataxia | | 1 |
| GLACOMA | | 3 |
| GLYCOMA AND CATARACT | | 1 |
| HAD A CATARACK SO HAVE A EYE LENS | | 1 |
| HEARING DEFICIT | | 1 |
| HEARING PROBLEMS | | 1 |
| HEARING/ CATERACTS | | 1 |
| INTERNAL HAEMORRAGE OF THE EYE DUE TO MYOPIA | | 1 |
| KERATACONIS | | 1 |
| ME | | 2 |
| MEMORY DISORDER | | 1 |
| MEMORY IMPAIRMENT FROM BRAIN HEAMORRHAGE | | 1 |
| MEMORY PROBLEMS | | 1 |
| MULTIPLE SCLEROSIS | | 1 |
| NUMBNESS IN LEG AND BUTTOCK | | 1 |
| PARITIALLY SIGHTED | | 1 |
| SCIATICA | | 3 |
| SCIATICA NERVE TRAPPED | | 1 |
| SHORT TERM MEMORY LOSS | | 1 |
| Spina Bifida,hydroceffilus, | | 1 |
| TREMORS | | 1 |
| dystonia | | 1 |
| glychoma | | 2 |
| macular degeneration | | 1 |
| peripheral neuropophy | | 1 |
| short sighted | | 1 |
| traped nerve | | 1 |
| | *Total* | 41 |
| **Ear problem** | | |
| EAR PAINS | | 1 |
| LABRYNTHITIS | | 1 |
| LEFT EAR PROBLEM | | 1 |
| MASTOIDITIS | | 1 |
| MENIER'S DISEASE | | 1 |
| MINIERES DISEASE | | 1 |
| Mineries - trouble with balance | | 1 |

| | | |
|---|---|---|
| SINUSES | | 1 |
| Sinus troubles | | 1 |
| TROUBLE WITH TONSILS | | 1 |
| | *Total* | 10 |
| **Heart and circulatory system problems** | | |
| AMAUROSIS FUGAX | | 1 |
| ANGINA | | 1 |
| ATRIAL FIBRILATION | | 1 |
| BLOCKED ARTERIES | | 1 |
| CHLOSTEROL, AND ANGINA | | 1 |
| CHOLESTEROL AND INCONTINENCE | | 1 |
| HIGH CHLESTEROL | | 1 |
| HIGH CHLOESTEROL | | 1 |
| HIGH CHOLESTEROL | | 6 |
| HIGH CHOLESTRAL | | 1 |
| HYPOTENSION | | 1 |
| LYMPHOVENUS DISEASE | | 1 |
| RAYNAUDS SYNDROME | | 1 |
| VARICOSE VEINS | | 2 |
| VERY LOW BLOOD PRESSURE | | 1 |
| high cholesterole | | 1 |
| | *Total* | 22 |
| **Digestive system** | | |
| ACID REFLUX | | 1 |
| CELIAC DISEASE | | 1 |
| COLITIS | | 1 |
| CROHNS DISEASE | | 2 |
| Crohne's Disease | | 1 |
| GALL BLADDER | | 1 |
| HERNIA | | 2 |
| Hiatus Hernia | | 1 |
| RECTAL FISSURE | | 1 |
| crohn, disease | | 1 |
| pancreatitus | | 1 |
| | *Total* | 13 |
| **Bladder/kidney problem** | | |
| BLADDER PROBLEM | | 1 |
| CHOLESTEROL AND INCONTINENCE | | 1 |
| CHRONIC URINARY TRACT INFECTION | | 1 |
| INCONTENANCE | | 1 |
| KIDNEY (UNDIAGNOSED, APPOINTMENT IN JULY 2010) | | 1 |
| KIDNEY DISEASE | | 1 |
| KIDNEY FAILURE | | 1 |
| KIDNEY PROBLEMS | | 2 |
| Kidney Dialysis | | 1 |
| Kidney and bladder troubles | | 1 |
| LUPIS, CHRONIC BLADDER INFECTION | | 1 |
| NARROW BLADDER | | 1 |
| OVER-ACTIVE BLADDER SYNDROME | | 1 |
| POLYCISTIC KIDNEY | | 1 |
| URINE PORBLEM | | 1 |
| kidney problems | | 1 |
| | *Total* | 17 |
| **Reproductive system** | | |
| Contraception | | 1 |
| IVF | | 1 |

| | | |
|---|---|---|
| PROSTATE | | 1 |
| PROSTATE PROBLEMS | | 1 |
| PROSTRATE | | 1 |
| | *Total* | 5 |

**Musculo-skeletal problem**

| | |
|---|---|
| ANKLE PROBLEM | 1 |
| ARTHRITIS | 1 |
| BAD SHOULDER AND KNEE | 1 |
| CHRONIC LEG PAIN AFTER AN OCCUPATIONAL ACCIDENT | 1 |
| CHRONIC LOWER BACK PAIN | 1 |
| CHRONIC PAIN | 2 |
| CHRONIC PAIN IN RIGHT ARM | 1 |
| CHRONIC PAIN IN RIGHT ARM AND SHOULDER | 1 |
| CURVED SPINE | 1 |
| DAMAGED LIGAMENTS | 1 |
| DE QUERVAIN'S | 1 |
| DISINTEGRATED L5 SPINAL DISC | 1 |
| FALIRIASIS/FOOT PROBLEM | 1 |
| Fibromyalgia | 1 |
| Foot reconstruction, bent toes | 1 |
| GOUT | 4 |
| Gout | 1 |
| HIP DISPLASIA | 1 |
| HIP REPLACEMENT | 1 |
| HIP TROUBLE | 1 |
| HYPERMOBILE | 1 |
| Hyper-Mobility | 1 |
| KNEE PROBLEM | 3 |
| KNEE PROBLEMS | 2 |
| Knee and Shoulder injuries | 1 |
| Knee injury | 1 |
| LEG PROBLEM DUE TO WORK INJURY | 1 |
| LONG TERM INJURY TO SHOULDER | 1 |
| LONG TERM LEG PAIN, WAS RECONSTRUCTED | 1 |
| LONG TERM PROBLEM WITH BROKEN ARM | 1 |
| Leg Trouble | 1 |
| MENISCUS PROBLEM | 1 |
| MINOR GOUT | 1 |
| Neck strain | 1 |
| OSGOODS LATTERS | 1 |
| OSTEOPEROSIS | 2 |
| OSTEOPORASIS (PAIN IN LEGS) | 1 |
| PAIN IN BONE IN BOTTOM | 1 |
| Problems with knee | 1 |
| Repetitive Strain Injury / Fibrymalgia | 1 |
| SCHOLIOS | 1 |
| SEVERE FOOT DISORDER | 1 |
| SHOULDER INJURY | 1 |
| SHOULDER PROBLEMS | 1 |
| Severe Pain in Shoulder | 1 |
| Spina Bifida,hydroceffilus, | 1 |
| Spinal Distal Muscular Atrophy | 1 |
| Spinal Fusion | 1 |
| WRIST PROBLEM | 1 |
| fractured ankle that never healed properly | 1 |
| gout | 1 |
| knee disc problem | 1 |

| | | |
|---|---|---|
| knee troubles | | 1 |
| leg problems - nerves and tendons twisted | | 1 |
| movement problem with legs | | 1 |
| problem with left foot/leg | | 1 |
| | *Total* | 64 |
| **Blood disorders** | | |
| ANAEMIC | | 1 |
| ANEAMIA | | 1 |
| ANEMIA | | 1 |
| ANTIPHILOSOLUPID | | 1 |
| ECZEMA/ SICKLE CELL TRAIT | | 1 |
| Eisonaphilia (High White Blood Count) | | 1 |
| HAEMOLETIC ANEAMIA | | 1 |
| IRON DEFICIENCY | | 1 |
| LOW BLODD PRESSURE | | 1 |
| Sickle Cell Anaemia | | 1 |
| TELASSAEMIA (ANEMIA) | | 1 |
| THALASMIA/ ANEMIA | | 1 |
| VON WILLEBRAND | | 1 |
| aenimic | | 1 |
| anemia (low blood pressure) | | 1 |
| anemic | | 1 |
| blood clots | | 1 |
| myleodysplastic syndrome (MDS) | | 1 |
| thick blood | | 1 |
| | *Total* | 19 |
| **Skin problems** | | |
| ABCESS ON BOTTOM | | 1 |
| ALAPECIA AND SWOLLEN FLESH IN LEG | | 1 |
| DERMATITUS | | 1 |
| ECXEMA | | 1 |
| ECZEMA | | 9 |
| ECZEMA/ SICKLE CELL TRAIT | | 1 |
| EXZCEMA | | 1 |
| EZCEMA | | 2 |
| HEAT RASH | | 1 |
| HYDRITINITIS- SKIN PROBLEM | | 1 |
| LIPODERMATOSCLEROSIS | | 1 |
| PSIORIASIS | | 1 |
| PSORIASES | | 1 |
| PSORIASIS | | 2 |
| Psoriasis | | 1 |
| SKIN PROBLEMS | | 1 |
| ULCERS ON LEGS | | 1 |
| alopecia | | 1 |
| eczma | | 1 |
| | *Total* | 29 |
| **Edocrine/immunity disorders** | | |
| ADRENAL DEFICIENCY AND THYROID | | 1 |
| AUTO IMMUNE INFLAMMATORY | | 1 |
| BENIGN THYROID NODULE | | 1 |
| GRAVES  DISEASE | | 1 |
| HYPO0THYROID | | 1 |
| HYPOTHYRODISM | | 2 |
| HYPOTHYROID | | 4 |
| HYPOTHYROID PROBLEM | | 1 |

| | | |
|---|---|---|
| HYPOTHYROIDISM | | 4 |
| HYPOTHYROIDISM | | 1 |
| LUPIS, CHRONIC BLADDER INFECTION | | 1 |
| Lupus | | 1 |
| THYROID | | 3 |
| THYROID | | 1 |
| THYROID PROBLEMS | | 1 |
| Thyroid problems | | 1 |
| UNDER ACTIVE THYROID | | 2 |
| UNDERACTIVE THYROID | | 1 |
| hyper thyroid | | 1 |
| hypo-thyroid | | 1 |
| | *Total* | 30 |
| **Respiratory problems** | | |
| CANT BREATHE THROUGH NOSE | | 1 |
| CHRONIC COUGH | | 1 |
| CHRONIC COUGH DUE TO LUNG OPERATION | | 1 |
| CHRONIC OBSTRUCTIVE PULMONARY DISEASE | | 1 |
| COPD - Breaathing difficulty | | 1 |
| COPD - Lung disorder brought on from smoking | | 1 |
| Chronic Obstructive Pulmonary Disease | | 2 |
| ENPHYSEMA - LUNG DISEASE | | 1 |
| LUNG SYNDROME | | 1 |
| Lung Disease | | 1 |
| SARCOIDOSIS | | 3 |
| SLEEP APNEA | | 1 |
| TICKLY COUGH | | 1 |
| lung problems | | 1 |
| sleep apeonia | | 1 |
| | *Total* | 18 |
| **Liver problems** | | |
| HEP C VIRUS | | 1 |
| HEPATITIS B | | 1 |
| Hep C | | 1 |
| | *Total* | 3 |
| **Non-psychotic mental disorder** | | |
| ASPERGERS | | 1 |
| AUTISM | | 1 |
| DYSLEXIA | | 3 |
| DYSPRAXIA | | 1 |
| EATING DISORDER | | 1 |
| Eating Disorder | | 1 |
| OCD | | 1 |
| OCD WITH ANGER ISSUES | | 1 |
| PTSD | | 1 |
| SPECIAL NEEDS | | 1 |
| adhd | | 1 |
| alcholism | | 1 |
| dyslexia | | 1 |
| mental disorder | | 1 |
| | *Total* | 16 |
| **Psychotic mental disorder** | | |
| Bi-Polar Disorder | | 1 |
| PARANOID SCHIZOPHRENIA/ PSYCHOSIS | | 1 |
| Paranoid Schizophrenia | | 1 |
| mental disorder | | 1 |

| | | |
|---|---|---|
| | *Total* | 4 |
| **Unclassifiable / Other** | | |
| ALLERGY | | 1 |
| HAY FEVER | | 1 |
| HAYFEVER | | 1 |
| HIV | | 8 |
| HIV POSITIVE | | 1 |
| INDUSTRIAL INJURY | | 1 |
| MARFANS | | 1 |
| RANARDES | | 1 |
| TIREDNESS | | 1 |
| WOULD NOT SAY | | 1 |
| fatigue | | 1 |
| | *Total* | 18 |

*Note:* Derived categories are not mutually exclusive.

***** The respondent reporting this ambiguous term was classified in both the non-psychotic and the psychotic disorder categories as both the CIS-R and the PSQ indicated presence of common mental disorder and psychotic symptoms, respectively.

Table A3 Specified "other" services or care sources used for those who did not report care use from any of the pre-specified categories to the survey item asking about 12-month service use for mental health reasons in SELCoH 1 and SELCoH 2

| **Excluded "other" services used for mental health reasons** | |
|---|---|
| **SELCoH 1 (N=12)** | **SELCoH 2 (N=17)** |
| ALEXANDER TECHNIQUE THERAPIST | CARE ASSISTANT |
| Dr at St Thomas's hospital that deals with diabetes | CAREER COACH |
| HOMEOPATH AND HYPNOTHERAPIST | CONSULTANT MEDICAL |
| KEY WORKERS AND SUPPORT WORKERS | HEALTH VISITOR |
| LIFE COACH | HIV KEY WORKER |
| NURSE | HOLISTIC THERAPIST |
| Nutritionist | HOMEOPATHY |
| OCCUPATIONAL HEALTH | HOSPITAL DOCTORS |
| PALLATIVE CARE DOCTOR | HRBALIST |
| PHYSICIAN | LIFE COACH |
| Para-Thyroid Consultant | NEUROLOGIST |
| VICTIM SUPPORT AND ACCUPUNCTURIST | NLP TRAINER |
| | NURSE |
| | SOCIAL WORKER |
| | SUPPORT WORKER |
| | SURGEON |
| | VICTIMS SUPPORT OFFICER |

## Appendix B

Table B1 The distribution of S1 participants (N=1198) across general practices in Lambeth and Southwark

| | n | % | (95% CI) |
|---|---|---|---|
| ***Lambeth practices*** | | | |
| Baldry Gardens Family Practice | 7 | 0.6 | (0.2-1.6) |
| The Courtyard Surgery | 4 | 0.3 | (0.1-0.8) |
| Crown Dale Medical Centre | 14 | 1.1 | (0.6-2.3) |
| The Deerbrook Surgery | 15 | 1.2 | (0.6-2.4) |
| Dr Ala's Surgery | 6 | 0.5 | (0.2-1.3) |
| Dr Curran & Partner | 12 | 0.9 | (0.4-2.0) |
| Dr Ivor Ferreira | 7 | 0.7 | (0.3-1.6) |
| Dr Santamaria | 4 | 0.4 | (0.1-1.5) |
| Dr Wickremesinghe | 1 | 0.1 | (0.0-0.6) |
| Dr Gunasuntharam Surgery | 3 | 0.2 | (0.0-1.1) |
| Beckett House Practice | 16 | 1.3 | (0.7-2.3) |
| Dr Masterton & Partners' Surgery | 4 | 0.4 | (0.1-1.5) |
| Dr Patel & Cresswell (Vassall Medical Centre) | 14 | 1.1 | (0.6-2.0) |
| Edith Cavell Practice | 6 | 0.4 | (0.2-1.2) |
| The Exchange Surgery | 6 | 0.4 | (0.1-1.1) |
| Foxley Square Surgery | 8 | 0.6 | (0.2-1.7) |
| Herne Hill Group Practice | 34 | 2.8 | (1.8-4.5) |
| Herne Hill Road Medical Practice | 15 | 1.5 | (0.7-3.0) |
| Binfield Road Surgery | 14 | 1.1 | (0.5-2.2) |
| Hetherington Group Practice | 28 | 2.3 | (1.5-3.7) |
| Hurley Clinic | 17 | 1.4 | (0.8-2.5) |
| Iveagh House Surgery | 14 | 1.2 | (0.7-2.4) |
| The Knights Hill Surgery | 6 | 0.5 | (0.2-1.1) |
| Lambeth Walk Group Practice | 12 | 1.1 | (0.5-2.2) |
| Mawbey Group Practice | 8 | 0.6 | (0.2-1.4) |
| Brixton Hill Group Practice | 15 | 1.1 | (0.6-2.1) |
| Myatts Field Health Centre | 9 | 0.8 | (0.4-1.6) |
| Norwood Surgery | 7 | 0.6 | (0.3-1.4) |
| Palace Road Surgery | 11 | 1.0 | (0.5-2.2) |
| Pavilion Practice | 5 | 0.5 | (0.2-1.5) |
| Paxton Green Group Practice | 56 | 5.2 | (3.6-7.4) |
| Water Lane Practice | 11 | 0.9 | (0.5-1.8) |
| Riverside Medical Practice | 6 | 0.5 | (0.2-1.4) |
| The Rosendale Surgery | 14 | 1.2 | (0.6-2.4) |
| Sandmere Road Practice | 7 | 0.6 | (0.3-1.4) |
| The South Lambeth Road Practice | 14 | 1.0 | (0.5-2.1) |
| Springfield Primary Care Centre | 4 | 0.4 | (0.1-1.2) |
| Stockwell Group Practice | 38 | 2.8 | (1.8-4.4) |
| Streatham Common Group Practice | 5 | 0.4 | (0.2-1.3) |
| Streatham High Surgery | 8 | 0.6 | (0.3-1.4) |
| Streatham Hill Group Practice | 12 | 1.1 | (0.5-2.2) |
| Streatham Place Surgery | 23 | 2.0 | (1.2-3.4) |
| Brockwell Park Surgery | 7 | 0.5 | (0.2-1.1) |
| Tulse Hill Practice, The | 22 | 1.7 | (0.9-3.0) |
| Valley Road Surgery | 4 | 0.4 | (0.1-1.1) |
| Vauxhall Surgery, The | 2 | 0.2 | (0.0-0.7) |
| Waterloo Health Centre | 7 | 0.6 | (0.2-1.6) |
| Baird Medical Centre | 1 | 0.1 | (0.0-0.4) |

| | | | | |
|---|---|---|---|---|
| Clapham Family Practice | | 33 | 3.0 | (1.9-4.5) |
| Clapham Park Group Practice | | 28 | 2.2 | (1.3-3.6) |
| The Corner Surgery | | 13 | 1.0 | (0.5-2.0) |
| | *Subtotal* | 637 | 53.2 | (49.4-56.9) |
| ***Southwark practices*** | | | | |
| The Acorn Surgery | | 18 | 1.5 | (0.8-2.7) |
| Blackfriars Medical Practice | | 4 | 0.4 | (0.2-1.2) |
| Borough Medical Centre (Dr Misra) | | 4 | 0.3 | (0.1-1.1) |
| Borough Medical Centre (Dr Sharma) | | 4 | 0.3 | (0.1-1.0) |
| Camberwell Green Surgery | | 28 | 2.2 | (1.4-3.5) |
| DMC Chadwick Road | | 4 | 0.3 | (0.1-0.9) |
| DMC Silverlock | | 3 | 0.2 | (0.0-1.4) |
| Dr Bradford & Partners | | 8 | 0.7 | (0.2-2.2) |
| Dr MAK Duggan | | 2 | 0.3 | (0.1-1.2) |
| Dr Sarma (East Dulwich Primary Care Centre) | | 13 | 1.0 | (0.4-2.4) |
| Dr Sinha & Partner | | 7 | 0.6 | (0.2-1.8) |
| Albion Street Group Practice | | 12 | 0.8 | (0.4-1.5) |
| Dulwich Medical Centre (Crystal Palace Road) | | 35 | 2.7 | (1.8-4.2) |
| Elm Lodge Surgery | | 15 | 1.4 | (0.7-2.6) |
| Falmouth Road Group Practice | | 17 | 1.3 | (0.7-2.5) |
| Forest Hill Group Practice | | 30 | 2.5 | (1.5-4.0) |
| The Gardens Surgery | | 14 | 1.2 | (0.6-2.3) |
| The Gaumont House Surgery | | 8 | 0.6 | (0.2-1.6) |
| The Grange Road Practice | | 23 | 2.1 | (1.2-3.6) |
| The Hambleden Clinic | | 6 | 0.4 | (0.1-1.2) |
| Hurley Group Practice at the Lister | | 1 | 0.1 | (0.0-0.4) |
| Bermondsey Spa Medical Centre | | 11 | 0.8 | (0.4-1.9) |
| Lister Primary Care Centre (Arumugaraasah) | | 3 | 0.2 | (0.1-1.0) |
| Lister Primary Care Centre (Hossain) | | 5 | 0.5 | (0.2-1.4) |
| Lister Primary Care Centre (Ullah) | | 4 | 0.3 | (0.1-1.4) |
| The Lordship Lane Surgery | | 15 | 1.2 | (0.7-2.2) |
| Manor Place Surgery | | 9 | 0.7 | (0.4-1.5) |
| Melbourne Grove Medical Practice | | 16 | 1.3 | (0.7-2.5) |
| New Mill Street Surgery | | 9 | 0.8 | (0.3-2.1) |
| The Nunhead Surgery, | | 19 | 1.8 | (1.0-3.2) |
| Old Kent Road Surgery | | 12 | 0.8 | (0.4-1.5) |
| Park Medical Centre | | 13 | 1.2 | (0.6-2.6) |
| BLMM: Artesian Health Centre | | 3 | 0.3 | (0.1-0.8) |
| Parkside Medical Centre (Concordia) | | 19 | 1.5 | (0.9-2.7) |
| Penrose Surgery | | 5 | 0.4 | (0.2-1.1) |
| Princess Street Group Practice | | 13 | 1.2 | (0.6-2.3) |
| Queens Road PHS Practice | | 11 | 1.0 | (0.5-2.2) |
| Sir John Kirk Close Surgery | | 9 | 0.6 | (0.3-1.5) |
| St Giles Surgery (Dr Patel) | | 14 | 1.3 | (0.6-2.6) |
| St Giles Surgery (Dr Virji) | | 9 | 0.8 | (0.4-1.7) |
| St James Church Surgery | | 2 | 0.2 | (0.0-1.0) |
| Avicenna Health Centre | | 1 | 0.1 | (0.0-0.6) |
| Sternhall Lane Surgery | | 6 | 0.5 | (0.2-1.1) |
| Surrey Docks Health Centre | | 17 | 1.4 | (0.8-2.4) |
| The Trafalgar Surgery, | | 12 | 1.0 | (0.5-2.0) |
| The Villa Street Medical Centre, | | 8 | 0.6 | (0.3-1.4) |
| Aylesbury Partnership: Aylesbury Medical Centre | | 11 | 1.0 | (0.5-2.3) |
| Aylesbury Partnership: Commercial Way Surgery | | 13 | 1.1 | (0.6-2.0) |
| Aylesbury Partnership: The Dun Cow Surgery | | 7 | 0.6 | (0.2-1.6) |
| BLMM: Decima Street Surgery | | 29 | 2.4 | (1.5-3.7) |

| | | | | |
|---|---|---|---|---|
| | *Subtotal* | 561 | 46.8 | (43.1-50.6) |
| | **TOTAL** | 1198 | 100.0 | |

Counts are unweighted; column percentages are weighted to account for clustering and non-response.

Table B2 Distribution of local GP surgeries by national QOF achievement tertiles

| | Number of GP surgeries in Southwark and Lambeth | |
|---|---|---|
| | n | % |
| ***Overall QOF achievement*** | | |
| Low | 50 | 50.0 |
| Moderate | 34 | 34.0 |
| High | 16 | 16.0 |
| ***Overall clinical achievement*** | | |
| Low | 40 | 40.0 |
| Moderate | 35 | 35.0 |
| High | 25 | 25.0 |
| ***Combined achievement of mental health and depression*** | | |
| Low | 35 | 35.0 |
| Moderate | 43 | 43.0 |
| High | 22 | 22.0 |
| ***Mental health achievement*** | | |
| Low | 38 | 38.0 |
| Moderate | 35 | 35.0 |
| High | 27 | 27.0 |
| ***Depression achievement*** | | |
| Low | 42 | 42.0 |
| Moderate | 38 | 38.0 |
| High | 20 | 20.0 |
| ***Achievement on indicator of depression screening in chronic physical conditions*** | | |
| Low | 42 | 42.0 |
| Moderate | 33 | 33.0 |
| High | 25 | 25.0 |

QOF, Quality Outcomes Framework

Table B3 Prevalence distribution of mental health service use patterns by perceived health and functioning

| | No MHSU (n=785) | | Discontinued MHSU (n=99) | | S2 initiated MHSU (n=81) | | Continuous MHSU (n=87) | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| ***Somatic symptom severity (S1)*** | | | | | | | | |
| Low | 522 | 83.6 | 47 | 7.6 | 31 | 4.9 | 24 | 3.8 |
| Medium | 189 | 67.1 | 29 | 10.9 | 31 | 11.2 | 30 | 10.9 |
| High | 70 | 50.9 | 23 | 16.2 | 18 | 12.5 | 31 | 20.4 |
| ***Self-rated health (S1)*** | | | | | | | | |
| Good/Very good/excellent | 687 | 78.9 | 73 | 8.7 | 57 | 6.6 | 51 | 5.9 |
| Fair/poor | 95 | 54.0 | 26 | 14.6 | 23 | 12.7 | 34 | 18.7 |
| ***Perceived functioning limitations due to emotional health (S1)*** | | | | | | | | |
| No | 695 | 79.5 | 71 | 8.4 | 66 | 7.8 | 38 | 4.3 |
| Yes | 86 | 50.5 | 28 | 16.4 | 14 | 7.5 | 46 | 25.5 |
| ***Daily functioning problems (S1)*** | | | | | | | | |
| None | 747 | 75.5 | 92 | 9.8 | 74 | 7.6 | 71 | 7.2 |
| 2 or more | 33 | 56.7 | 7 | 10.4 | 6 | 10.0 | 14 | 22.9 |
| ***MIS (S2)*** | | | | | | | | |
| No | 673 | 85.0 | 61 | 7.7 | 35 | 4.4 | 22 | 2.9 |
| Yes | 113 | 43.8 | 38 | 15.4 | 45 | 16.9 | 65 | 23.9 |

MHSU, mental health service use; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures

[a] Move out of or persistently out of employment or education in working age (<65).

Table B4 Unadjusted associations between comorbidity and socio-demographic and socio-economic factors in the S1 sample (N=1698)

| | No MIS (n=1192) | | | Non-comorbid MIS (n=247) | | | | | MIS-physical comorbidity (n=242) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR | (95% CI) | *p* | n | % | RRR | (95% CI) | *p* |
| ***Gender (S1)*** | | | | | | | | | | | | | |
| Male | 551 | 75.6 | | 100 | 12.4 | 1.00 | | | 81 | 12.1 | 1.00 | | |
| Female | 641 | 67.6 | 1.00 | 147 | 14.3 | 1.29 | (0.98-1.70) | 0.066 | 161 | 18.1 | 1.68 | (1.26-2.25) | <0.001 |
| ***Age (S1)*** | | | | | | | | | | | | | |
| 16-29 | 396 | 68.0 | | 129 | 22.8 | 1.00 | | | 50 | 9.1 | 1.00 | | |
| 30-39 | 267 | 76.7 | 1.00 | 46 | 13.0 | 0.50 | (0.34-0.74) | <0.001 | 34 | 10.3 | 1.00 | (0.61-1.64) | 0.998 |
| 40-49 | 208 | 67.0 | 1.00 | 42 | 13.9 | 0.62 | (0.42-0.92) | 0.017 | 54 | 19.1 | 2.12 | (1.37-3.30) | <0.001 |
| 50-59 | 137 | 63.9 | 1.00 | 20 | 9.6 | 0.45 | (0.27-0.75) | 0.003 | 54 | 26.5 | 3.09 | (1.97-4.83) | <0.001 |
| 60 or over | 184 | 74.6 | 1.00 | 10 | 4.5 | 0.18 | (0.09-0.35) | <0.001 | 50 | 20.9 | 2.09 | (1.33-3.30) | 0.002 |
| ***Relationship status (S1)*** | | | | | | | | | | | | | |
| Married/cohabitating | 602 | 76.8 | | 80 | 9.6 | 1.00 | | | 97 | 13.7 | 1.00 | | |
| Single | 448 | 66.2 | 1.00 | 138 | 19.9 | 2.42 | (1.78-3.29) | <0.001 | 85 | 13.9 | 1.18 | (0.83-1.66) | 0.352 |
| Previously in relationship | 142 | 61.4 | 1.00 | 29 | 11.7 | 1.53 | (0.94-2.47) | 0.085 | 60 | 26.9 | 2.46 | (1.66-3.65) | <0.001 |
| ***Ethnicity (S1)*** | | | | | | | | | | | | | |
| White | 738 | 70.4 | | 149 | 13.1 | 1.00 | | | 155 | 16.5 | 1.00 | | |
| Black Caribbean | 87 | 60.0 | 1.00 | 27 | 16.9 | 1.51 | (0.90-2.53) | 0.115 | 27 | 23.1 | 1.64 | (1.00-2.71) | 0.051 |
| Black African | 174 | 76.2 | 1.00 | 36 | 14.7 | 1.04 | (0.65-1.64) | 0.882 | 20 | 9.1 | 0.51 | (0.30-0.87) | 0.014 |
| Other | 193 | 71.2 | 1.00 | 34 | 12.6 | 0.95 | (0.62-1.45) | 0.802 | 39 | 16.2 | 0.97 | (0.65-1.45) | 0.899 |
| ***Migrant (S1)*** | | | | | | | | | | | | | |
| UK born | 706 | 70.4 | | 153 | 14.0 | 1.00 | | | 146 | 15.6 | 1.00 | | |
| <10 years in the UK | 235 | 73.4 | 1.00 | 50 | 16.9 | 1.16 | (0.80-1.68) | 0.441 | 26 | 9.7 | 0.60 | (0.37-0.97) | 0.037 |
| ≥10 years in the UK | 222 | 66.5 | 1.00 | 40 | 10.6 | 0.80 | (0.54-1.19) | 0.274 | 67 | 22.9 | 1.55 | (1.10-2.19) | 0.012 |
| ***Education (S1)*** | | | | | | | | | | | | | |
| No qualifications | 143 | 64.2 | 1.00 | 26 | 9.8 | 1.05 | (0.63-1.74) | 0.862 | 55 | 26.0 | 3.21 | (2.08-4.94) | <0.001 |
| GCSE | 206 | 63.3 | 1.00 | 59 | 16.1 | 1.75 | (1.17-2.60) | 0.006 | 61 | 20.7 | 2.59 | (1.72-3.90) | <0.001 |
| A-level | 288 | 67.2 | 1.00 | 80 | 18.6 | 1.90 | (1.33-2.70) | <0.001 | 56 | 14.3 | 1.68 | (1.12-2.54) | 0.013 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Degree or above | 544 | 78.6 | | 81 | 11.5 | 1.00 | | | 63 | 9.9 | 1.00 | | |
| ***Employment status[a] (S1)*** | | | | | | | | | | | | | |
| Working | 736 | 74.9 | | 134 | 13.4 | 1.00 | | | 105 | 11.7 | 1.00 | | |
| Not working | 305 | 63.4 | 1.00 | 64 | 11.1 | 0.97 | (0.69-1.38) | 0.880 | 121 | 25.5 | 2.58 | (1.89-3.53) | <0.001 |
| Students | 147 | 70.7 | 1.00 | 47 | 22.7 | 1.79 | (1.22-2.62) | 0.003 | 13 | 6.6 | 0.60 | (0.32-1.11) | 0.103 |
| ***Annual household income (S1)*** | | | | | | | | | | | | | |
| £0-5,475 | 70 | 52.9 | 1.00 | 26 | 16.1 | 1.89 | (1.11-3.20) | 0.018 | 41 | 31.1 | 5.26 | (3.17-8.71) | <0.001 |
| £5,476-12,097 | 135 | 65.0 | 1.00 | 31 | 12.9 | 1.23 | (0.78-1.96) | 0.372 | 43 | 22.1 | 3.04 | (1.93-4.79) | <0.001 |
| £12,098-20,753 | 135 | 65.0 | 1.00 | 26 | 11.8 | 1.13 | (0.69-1.85) | 0.640 | 42 | 23.2 | 3.20 | (2.04-5.00) | <0.001 |
| £20,754-31,494 | 129 | 72.6 | 1.00 | 29 | 15.2 | 1.30 | (0.79-2.13) | 0.296 | 19 | 12.2 | 1.50 | (0.82-2.73) | 0.185 |
| £31,495 or more | 548 | 78.6 | | 90 | 12.7 | 1.00 | | | 60 | 8.8 | 1.00 | | |
| ***Debt (S1)*** | | | | | | | | | | | | | |
| No debt | 1029 | 74.2 | | 173 | 11.9 | 1.00 | | | 168 | 13.9 | 1.00 | | |
| Any debt | 153 | 52.5 | 1.00 | 71 | 22.5 | 2.68 | (1.91-3.78) | <0.001 | 67 | 24.9 | 2.53 | (1.78-3.60) | <0.001 |
| ***Benefits[b] (S1)*** | | | | | | | | | | | | | |
| No benefits receipt | 1001 | 74.2 | | 181 | 12.6 | 1.00 | | | 159 | 13.2 | 1.00 | | |
| Benefits receipt | 183 | 54.2 | 1.00 | 66 | 18.0 | 1.95 | (1.41-2.71) | <0.001 | 83 | 27.8 | 2.88 | (2.09-3.97) | <0.001 |

MIS, mental illness symptoms; RRR, relative risk ratio; CI, confidence interval; (S1), S1 measure; (S2), S2 measure

Counts are unweighted; row percentages are weighted to account for clustering and non-response.

"No MIS" represents the base category in the multinomial regression.

[a] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness. [b] Benefits are non-health related

Table B5 Unadjusted associations[a] between comorbidity and social factors in the S1 sample (N=1698)

| **Comorbidity (S1)** | N | n | % | RRR /OR | n | % | RRR /OR (95% CI) | *p* | n | % | RRR (95% CI) | *p* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ***Social support (S1)*** | | | | | | | |
| | | *Low* | | | *High* | | | | | | | |
| No MIS | 1192 | 210 | 18.4 | | 970 | 81.6 | 1.00 | | | | | |
| Non-comorbid MIS | 247 | 62 | 25.5 | 1.00 | 183 | 74.5 | 0.66[b] (0.47-0.93) | 0.017 | | | | |
| MIS-physical comorbidity | 242 | 78 | 34.6 | 1.00 | 157 | 65.4 | 0.43[b] (0.31-0.59) | <0.001 | | | | |
| | | | | | ***Social network size (no. contacts) (S1)*** | | | | | | | |
| | | *0-2[c]* | | | *3-4* | | | | *5 or more* | | | |
| No MIS | 1192 | 85 | 8.2 | | 339 | 28.8 | 1.00 | | 763 | 63.1 | 1.00 | |
| Non-comorbid MIS | 247 | 27 | 12.3 | 1.00 | 79 | 31.6 | 0.73 (0.43-1.23) | 0.241 | 140 | 56.1 | 0.59 (0.36-0.97) | 0.039 |
| MIS-physical comorbidity | 242 | 39 | 15.5 | 1.00 | 94 | 41.1 | 0.75 (0.47-1.21) | 0.240 | 107 | 43.4 | 0.36 (0.23-0.58) | <0.001 |
| | | | | | ***Stressful life events (S1)*** | | | | | | | |
| | | *0-2[c]* | | | *3-5* | | | | *6 or more* | | | |
| No MIS | 1192 | 478 | 40.6 | | 537 | 45.2 | 1.00 | | 171 | 14.2 | 1.00 | |
| Non-comorbid MIS | 247 | 69 | 28.2 | 1.00 | 105 | 44.3 | 1.41[b] (1.01-1.98) | 0.045 | 72 | 27.4 | 2.77[b] (1.88-4.09) | <0.001 |
| MIS-physical comorbidity | 242 | 38 | 16.0 | 1.00 | 103 | 43.4 | 2.44[b] (1.64-3.62) | <0.001 | 99 | 40.6 | 7.24[b] (4.68-11.21) | <0.001 |

RRR, relative risk ratio; OR, odds ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure

[a] Regression analyses are logistic regressions, with the exception of social network size and stressful life events which were tested in multinomial regression models. [b] The contrasts between the non-comorbid MIS and the MIS-physical comorbidity groups were significant at $p<0.05$ [c] Represent the base category in the multinomial regression.

Table B6 Unadjusted associations between explanatory factors and 12-month mental health service use (S1) (N=1698)

| | No MHSU (n=1406) | | | Primary MHSU only (n=143) | | | | | Secondary MHSU[a] (n=135) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR | (95% CI) | *p* | n | % | RRR | (95% CI) | *p* |
| ***Gender (S1)*** | | | | | | | | | | | | | |
| Male | 636 | 86.9 | 1.00 | 50 | 6.9 | 1.00 | | | 48 | 6.2 | 1.00 | | |
| Female | 770 | 81.3 | 1.00 | 93 | 9.8 | 1.52 | (1.04-2.21) | 0.029 | 87 | 9.0 | 1.55 | (1.08-2.24) | 0.019 |
| ***Age (S1)*** | | | | | | | | | | | | | |
| 16-29 | 481 | 82.8 | | 48 | 8.8 | 1.00 | | | 47 | 8.4 | 1.00 | | |
| 30-39 | 290 | 82.5 | 1.00 | 29 | 8.9 | 1.01 | (0.61-1.68) | 0.955 | 30 | 8.5 | 1.02 | (0.62-1.68) | 0.941 |
| 40-49 | 250 | 81.8 | 1.00 | 28 | 9.2 | 1.05 | (0.64-1.72) | 0.846 | 26 | 9.1 | 1.09 | (0.65-1.82) | 0.744 |
| 50-59 | 167 | 78.2 | 1.00 | 22 | 11.2 | 1.35 | (0.78-2.33) | 0.283 | 21 | 10.6 | 1.33 | (0.75-2.35) | 0.329 |
| 60 or over | 218 | 88.6 | 1.00 | 16 | 6.8 | 0.72 | (0.40-1.31) | 0.280 | 11 | 4.6 | 0.51 | (0.26-1.02) | 0.057 |
| ***Relationship status (S1)*** | | | | | | | | | | | | | |
| Married/cohabitating | 673 | 85.9 | | 60 | 7.8 | 1.00 | | | 45 | 6.3 | 1.00 | | |
| Single | 556 | 81.5 | 1.00 | 57 | 9.4 | 1.27 | (0.86-1.89) | 0.231 | 62 | 9.1 | 1.53 | (1.01-2.32) | 0.046 |
| Previously in relationship | 177 | 79.4 | 1.00 | 26 | 10.4 | 1.44 | (0.86-2.41) | 0.163 | 28 | 10.3 | 1.76 | (1.03-2.98) | 0.037 |
| ***Ethnicity (S1)*** | | | | | | | | | | | | | |
| White | 858 | 82.3 | | 88 | 8.6 | 1.00 | | | 96 | 9.2 | 1.00 | | |
| Black Caribbean | 118 | 82.6 | 1.00 | 13 | 9.8 | 1.14 | (0.61-2.14) | 0.689 | 10 | 7.7 | 0.83 | (0.42-1.66) | 0.605 |
| Black African | 202 | 85.5 | 1.00 | 22 | 10.0 | 1.12 | (0.67-1.88) | 0.669 | 10 | 4.5 | 0.47 | (0.22-1.01) | 0.054 |
| Other | 227 | 85.4 | 1.00 | 19 | 7.9 | 0.89 | (0.53-1.50) | 0.668 | 19 | 6.6 | 0.70 | (0.41-1.19) | 0.184 |
| ***Migrant (S1)*** | | | | | | | | | | | | | |
| UK born | 832 | 83.1 | | 85 | 8.6 | 1.00 | | | 83 | 8.3 | 1.00 | | |
| <10 years in the UK | 263 | 82.3 | 1.00 | 27 | 9.4 | 1.11 | (0.68-1.80) | 0.685 | 25 | 8.2 | 1.01 | (0.62-1.63) | 0.975 |
| ≥10 years in the UK | 279 | 83.4 | 1.00 | 28 | 9.0 | 1.04 | (0.65-1.66) | 0.879 | 26 | 7.6 | 0.92 | (0.57-1.47) | 0.715 |
| ***Education (S1)*** | | | | | | | | | | | | | |
| No qualifications | 188 | 83.2 | 1.00 | 25 | 11.1 | 2.21 | (1.26-3.87) | 0.006 | 14 | 5.7 | 0.62 | (0.33-1.17) | 0.139 |
| GCSE | 263 | 80.3 | 1.00 | 38 | 12.5 | 2.60 | (1.58-4.26) | <0.001 | 25 | 7.2 | 0.80 | (0.49-1.32) | 0.387 |
| A-level | 350 | 82.0 | 1.00 | 42 | 10.2 | 2.07 | (1.27-3.35) | 0.003 | 33 | 7.8 | 0.86 | (0.55-1.35) | 0.518 |
| Degree or above | 590 | 85.4 | | 36 | 5.1 | 1.00 | | | 61 | 9.5 | 1.00 | | |
| ***Employment status[b] (S1)*** | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Working | 837 | 85.1 | | 70 | 7.3 | 1.00 | | | 71 | 7.6 | 1.00 | | | |
| Not working | 388 | 80.1 | 1.00 | 60 | 12.0 | 1.73 | (1.19-2.53) | 0.005 | 42 | 7.9 | 1.10 | (0.72-1.68) | 0.643 | |
| Students | 174 | 83.4 | 1.00 | 11 | 5.6 | 0.77 | (0.39-1.52) | 0.456 | 22 | 11.1 | 1.49 | (0.89-2.49) | 0.129 | |
| ***Annual household income (S1)*** | | | | | | | | | | | | | | |
| £0-5,475 | 92 | 66.9 | 1.00 | 27 | 20.3 | 3.78 | (2.19-6.52) | <0.001 | 20 | 12.8 | 2.09 | (1.15-3.83) | 0.016 | |
| £5,476-12,097 | 166 | 79.6 | 1.00 | 23 | 11.4 | 1.78 | (1.03-3.10) | 0.041 | 21 | 8.9 | 1.23 | (0.69-2.17) | 0.480 | |
| £12,098-20,753 | 173 | 85.1 | 1.00 | 16 | 8.2 | 1.19 | (0.64-2.20) | 0.578 | 13 | 6.7 | 0.87 | (0.45-1.67) | 0.671 | |
| £20,754-31,494 | 151 | 85.3 | 1.00 | 14 | 8.5 | 1.24 | (0.67-2.32) | 0.494 | 12 | 6.2 | 0.80 | (0.41-1.54) | 0.497 | |
| £31,495 or more | 597 | 85.3 | | 49 | 6.9 | 1.00 | | | 51 | 7.8 | 1.00 | | | |
| ***Debt (S1)*** | | | | | | | | | | | | | | |
| No debt | 1164 | 84.6 | | 105 | 7.9 | 1.00 | | | 102 | 7.5 | 1.00 | | | |
| Debt | 227 | 76.6 | 1.00 | 36 | 13.5 | 1.89 | (1.24-2.87) | 0.003 | 30 | 10.0 | 1.47 | (0.95-2.27) | 0.084 | |
| ***Benefits[c] (S1)*** | | | | | | | | | | | | | | |
| No benefits receipt | 1151 | 85.8 | | 95 | 7.1 | 1.00 | | | 94 | 7.1 | 1.00 | | | |
| Benefits receipt | 248 | 72.9 | 1.00 | 48 | 15.6 | 2.58 | (1.75-3.80) | <0.001 | 40 | 11.5 | 1.91 | (1.27-2.86) | 0.002 | |
| ***Social support (S1)*** | | | | | | | | | | | | | | |
| Low | 273 | 79.1 | | 42 | 11.8 | 1.00 | | | 33 | 9.1 | 1.00 | | | |
| High | 1111 | 84.3 | 1.00 | 99 | 8.0 | 0.63 | (0.43-0.94) | 0.024 | 101 | 7.8 | 0.80 | (0.52-1.24) | 0.328 | |
| ***Social network size (S1)*** | | | | | | | | | | | | | | |
| 2 or less | 112 | 72.9 | | 25 | 16.7 | 1.00 | | | 17 | 10.4 | 1.00 | | | |
| 3-4 | 425 | 84.1 | 1.00 | 46 | 8.8 | 0.46 | (0.26-0.79) | 0.005 | 40 | 7.1 | 0.59 | (0.31-1.10) | 0.098 | |
| 5 or more | 858 | 84.3 | 1.00 | 71 | 7.4 | 0.38 | (0.23-0.65) | <0.001 | 78 | 8.3 | 0.69 | (0.38-1.25) | 0.216 | |
| ***Stressful life events (S1)*** | | | | | | | | | | | | | | |
| 0-2 | 532 | 90.8 | | 31 | 5.3 | 1.00 | | | 23 | 3.8 | 1.00 | | | |
| 3-5 | 623 | 82.9 | 1.00 | 65 | 9.2 | 1.89 | (1.20-2.97) | 0.006 | 58 | 7.9 | 2.26 | (1.35-3.80) | 0.002 | |
| 6 or more | 240 | 70.5 | 1.00 | 46 | 13.9 | 3.34 | (2.04-5.47) | <0.001 | 53 | 15.6 | 5.24 | (3.08-8.93) | <0.001 | |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms

Counts are unweighted; row percentages are weighted to account for clustering and non-response.

"No service use" represents the base category in the multinomial regression.

[a] Includes those who reported use of primary, as well as secondary services. [b] Working include those who are currently in employment or temporarily off work due to illness; not working includes those who are unemployed, retired, looking after home and children and permanently off work due to disability or illness. [c] Benefits are non-health related

Table B7 Block-adjusted models of cross-sectional associations of comorbidity and mental health service use (S1), adjusting for of socio-demographic, socio-economic and psychosocial factors (N=1698)

| | **No MHSU (n=1406)** | **Primary MHSU only (n=143)** | | **Secondary MHSU[a] (n=135)** | |
|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Block-adjusted socio-demographic model*** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No MIS | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.62 (2.92-7.30) | <0.001 | 4.15 (2.48-6.95) | <0.001 |
| MIS-physical comorbidity | 1.00 | 6.83 (4.29-10.86) | <0.001 | 7.01 (4.32-11.37) | <0.001 |
| ***Female (S1)*** | 1.00 | 1.38 (0.93-2.05) | 0.114 | 1.35 (0.91-1.99) | 0.134 |
| ***Age (continuous) (S1)*** | 1.00 | 1.00 (0.99-1.01) | 0.712 | 0.98 (0.97-1.00) | 0.021 |
| ***Non-White Ethnicity (S1)*** | 1.00 | 0.94 (0.61-1.43) | 0.759 | 0.55 (0.34-0.87) | 0.011 |
| ***Migrant status (S1)*** | | | | | |
| UK born | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.20 (0.72-2.00) | 0.482 | 1.11 (0.65-1.90) | 0.701 |
| ≥10 years in the UK | 1.00 | 0.92 (0.53-1.61) | 0.772 | 1.12 (0.65-1.90) | 0.688 |
| ***Block-adjusted socio-economic model*** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 3.95 (2.43-6.41) | <0.001 | 4.41 (2.53-7.68) | <0.001 |
| MIS-physical comorbidity | 1.00 | 4.87 (2.93-8.10) | <0.001 | 8.32 (4.96-13.96) | <0.001 |
| ***Education (S1)*** | | | | | |
| No qualifications | 1.00 | 1.42 (0.69-2.94) | 0.342 | 0.23 (0.09-0.59) | 0.002 |
| GCSE | 1.00 | 1.83 (0.98-3.44) | 0.059 | 0.48 (0.24-0.93) | 0.030 |
| A-level | 1.00 | 1.65 (0.93-2.92) | 0.085 | 0.55 (0.31-0.96) | 0.035 |
| Degree or above | | 1.00 | | 1.00 | |
| ***Employment status[b] (S1)*** | | | | | |
| Working | | 1.00 | | 1.00 | |
| Not working | 1.00 | 1.33 (0.80-2.19) | 0.268 | 0.84 (0.46-1.51) | 0.550 |
| Students | 1.00 | 0.92 (0.41-2.04) | 0.830 | 1.93 (0.99-3.76) | 0.054 |

| | | | | | |
|---|---|---|---|---|---|
| ***Annual household income (S1)*** | | | | | |
| £0-5,475 | 1.00 | 1.29 (0.66-2.53) | 0.453 | 1.77 (0.84-3.75) | 0.133 |
| £5,476-12,097 | 1.00 | 0.87 (0.44-1.72) | 0.691 | 1.49 (0.76-2.92) | 0.245 |
| £12,098-20,753 | 1.00 | 0.64 (0.31-1.32) | 0.225 | 0.87 (0.40-1.89) | 0.724 |
| £20,754-31,494 | 1.00 | 0.86 (0.44-1.69) | 0.666 | 0.72 (0.33-1.56) | 0.405 |
| £31,495 or more | | 1.00 | | 1.00 | |
| ***Benefits[c] (S1)*** | 1.00 | 1.43 (0.88-2.32) | 0.146 | 1.72 (1.02-2.91) | 0.042 |
| ***Block-adjusted social model*** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.46 (2.83-7.04) | <0.001 | 4.13 (2.47-6.91) | <0.001 |
| MIS-physical comorbidity | 1.00 | 5.82 (3.68-9.19) | <0.001 | 5.22 (3.17-8.60) | <0.001 |
| ***High social support (S1)*** | 1.00 | 0.95 (0.61-1.48) | 0.812 | 1.09 (0.68-1.75) | 0.720 |
| ***Social network size (S1)*** | | | | | |
| 2 or less contacts | | 1.00 | | 1.00 | |
| 3-4 contacts | 1.00 | 0.48 (0.27-0.86) | 0.013 | 0.63 (0.31-1.25) | 0.186 |
| 5 or more contacts | 1.00 | 0.51 (0.29-0.91) | 0.022 | 0.96 (0.48-1.88) | 0.895 |
| ***Stressful life events (S1)*** | | | | | |
| 0-2 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 1.60 (1.00-2.55) | 0.049 | 2.06 (1.21-3.51) | 0.008 |
| 6 or more | 1.00 | 1.91 (1.12-3.28) | 0.018 | 3.49 (1.93-6.31) | <0.001 |

MHSU, mental health service use; RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure
"No MHSU" represent the base category in the multinomial regression.

Table B8 Unadjusted associations between comorbidity and socio-demographic and socio-economic indicators in the S2 cohort sample (N=1052)

| | No MIS (n=743) | | | Non-comorbid MIS (n=145) | | | | | MIS-physical comorbidity (n=157) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR | (95% CI) | *p* | n | % | RRR | (95% CI) | *p* |
| ***Gender (S1)*** | | | | | | | | | | | | | |
| Male | 327 | 73.8 | | 52 | 11.9 | 1.00 | | | 58 | 14.3 | 1.00 | | |
| Female | 416 | 67.7 | 1.00 | 93 | 15.1 | 1.47 | (1.02-2.10) | 0.037 | 99 | 17.2 | 1.27 | (0.88-1.82) | 0.195 |
| ***Age (S1)*** | | | | | | | | | | | | | |
| 16-29 | 213 | 66.8 | | 73 | 24.0 | 1.00 | | | 27 | 9.1 | 1.00 | | |
| 30-39 | 173 | 80.1 | 1.00 | 23 | 10.4 | 0.36 | (0.22-0.61) | <0.001 | 19 | 9.5 | 0.85 | (0.44-1.64) | 0.627 |
| 40-49 | 143 | 67.9 | 1.00 | 25 | 12.6 | 0.52 | (0.32-0.86) | 0.011 | 35 | 19.6 | 1.99 | (1.12-3.53) | 0.018 |
| 50-59 | 93 | 57.8 | 1.00 | 16 | 10.9 | 0.52 | (0.28-0.96) | 0.035 | 46 | 31.4 | 3.76 | (2.16-6.53) | <0.001 |
| 60 or over | 121 | 75.5 | 1.00 | 8 | 5.6 | 0.21 | (0.10-0.46) | <0.001 | 30 | 18.9 | 1.82 | (0.99-3.33) | 0.053 |
| ***Relationship status (S1)*** | | | | | | | | | | | | | |
| Married/cohabitating | 405 | 76.9 | | 49 | 9.4 | 1.00 | | | 65 | 13.7 | 1.00 | | |
| Single | 244 | 64.5 | 1.00 | 77 | 21.0 | 2.59 | (1.73-3.86) | <0.001 | 52 | 14.5 | 1.35 | (0.88-2.08) | 0.164 |
| Previously in relationship | 94 | 61.1 | 1.00 | 19 | 12.3 | 1.66 | (0.91-3.02) | 0.099 | 40 | 26.6 | 2.36 | (1.45-3.82) | <0.001 |
| ***Ethnicity (S1)*** | | | | | | | | | | | | | |
| White | 474 | 67.9 | | 100 | 14.6 | 1.00 | | | 111 | 17.5 | 1.00 | | |
| Black Caribbean | 52 | 65.2 | 1.00 | 14 | 17.9 | 1.20 | (0.62-2.33) | 0.593 | 12 | 16.9 | 1.09 | (0.53-2.24) | 0.811 |
| Black African | 101 | 77.1 | 1.00 | 14 | 11.9 | 0.67 | (0.33-1.33) | 0.246 | 13 | 10.9 | 0.52 | (0.27-1.01) | 0.054 |
| Other | 116 | 75.1 | 1.00 | 17 | 11.3 | 0.71 | (0.40-1.28) | 0.258 | 20 | 13.7 | 0.77 | (0.45-1.32) | 0.345 |
| ***Migrant (S1)*** | | | | | | | | | | | | | |
| UK born | 477 | 70.7 | | 94 | 14.2 | 1.00 | | | 95 | 15.1 | 1.00 | | |
| <10 years in the UK | 119 | 69.8 | 1.00 | 27 | 18.0 | 1.35 | (0.83-2.20) | 0.220 | 17 | 12.2 | 0.83 | (0.46-1.51) | 0.551 |
| ≥10 years in the UK | 129 | 65.5 | 1.00 | 21 | 10.3 | 0.73 | (0.42-1.25) | 0.251 | 44 | 24.2 | 1.69 | (1.10-2.59) | 0.016 |
| ***Education (S1+S2)*** | | | | | | | | | | | | | |
| No qualifications | 56 | 60.7 | | 8 | 8.2 | 0.86 | (0.38-1.92) | 0.711 | 27 | 31.1 | 4.60 | (2.59-8.16) | <0.001 |
| GCSE | 104 | 62.0 | 1.00 | 24 | 13.9 | 1.43 | (0.82-2.49) | 0.203 | 37 | 24.1 | 3.50 | (2.11-5.78) | <0.001 |
| A-level | 163 | 61.4 | 1.00 | 49 | 19.6 | 2.03 | (1.32-3.12) | 0.001 | 48 | 19.0 | 2.78 | (1.73-4.46) | <0.001 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Degree or above | 420 | 78.8 | 1.00 | 64 | 12.4 | 1.00 | | | 45 | 8.8 | 1.00 | | |
| ***Adverse employment conditions[a] (S1+S2)*** | | | | | | | | | | | | | |
| No | 620 | 74.5 | | 109 | 13.4 | 1.00 | | | 92 | 12.0 | 1.00 | | |
| Yes | 120 | 53.6 | 1.00 | 34 | 15.4 | 1.59 | (1.02-2.49) | 0.042 | 65 | 31.1 | 3.60 | (2.41-5.38) | <0.001 |
| ***Low household income[b] (S1+S2)*** | | | | | | | | | | | | | |
| No | 520 | 76.0 | | 86 | 12.9 | 1.00 | | | 72 | 11.1 | 1.00 | | |
| Yes | 92 | 53.7 | 1.00 | 23 | 13.2 | 1.45 | (0.85-2.46) | 0.170 | 53 | 33.1 | 4.21 | (2.73-6.50) | <0.001 |
| ***Chronic debt (S1+S2)*** | | | | | | | | | | | | | |
| No | 705 | 72.6 | | 125 | 13.3 | 1.00 | | | 124 | 14.1 | 1.00 | | |
| Yes | 32 | 39.0 | 1.00 | 18 | 22.6 | 3.16 | (1.61-6.19) | <0.001 | 28 | 38.5 | 5.10 | (2.85-9.11) | <0.001 |
| ***Benefits[c] (S1+S2)*** | | | | | | | | | | | | | |
| No | 572 | 74.1 | | 99 | 13.2 | 1.00 | | | 90 | 12.7 | 1.00 | | |
| Yes | 165 | 57.6 | 1.00 | 46 | 16.6 | 1.63 | (1.09-2.42) | 0.017 | 67 | 25.8 | 2.61 | (1.80-3.79) | <0.001 |

MIS, mental illness symptoms; RRR, relative risk ratio; CI, confidence interval; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures
Counts are unweighted; row percentages are weighted to account for clustering, non-response, changes in household structure from S1 to S2, and attrition.
"No MIS" represents the base category in the multinomial regression.
[a] Move out of or persistently out of employment or education in working age (<65). [b] A sharp decline in household income or persistently low household income between S1 and S2.
[c] Benefits are non-health related

Table B9 Unadjusted associations[a] between comorbidity and social and attitudinal factors in the S2 cohort sample (N=1052)

| **Comorbidity (S1)** | N | n | % | RRR /OR | n | % | RRR /OR | (95% CI) | *p* | n | % | RRR (95% CI) | *p* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ***MIS (S2)*** | | | | | | |
| | | *No MIS* | | | | | *MIS* | | | | | | |
| No MIS | 745 | 652 | 87.6 | | 91 | 12.4 | 1.00 | | | | | | |
| Non-comorbid MIS | 145 | 83 | 55.0 | 1.00 | 62 | 45.0 | 5.79[b] | (3.83-8.75) | <0.001 | | | | |
| MIS-physical comorbidity | 157 | 52 | 31.1 | 1.00 | 105 | 68.9 | 15.62[b] | (10.26-23.77) | <0.001 | | | | |
| | | | | | | | ***Social support (S1)*** | | | | | | |
| | | *Low* | | | | | *High* | | | | | | |
| No MIS | 745 | 111 | 15.4 | | 627 | 84.6 | 1.00 | | | | | | |
| Non-comorbid MIS | 145 | 25 | 17.9 | 1.00 | 119 | 82.1 | 0.61[b] | (0.43-0.88) | 0.007 | | | | |
| MIS-physical comorbidity | 157 | 51 | 35.0 | 1.00 | 103 | 65.0 | 0.36[b] | (0.26-0.50) | <0.001 | | | | |
| | | | | | | | ***Social network size (no. contacts S1)*** | | | | | | |
| | | *0-2[c]* | | | | | *3-4* | | | | | *5 or more* | |
| No MIS | 745 | 70 | 7.1 | | 308 | 29.1 | 1.00 | | | 714 | 63.8 | 1.00 | |
| Non-comorbid MIS | 145 | 27 | 12.9 | 1.00 | 74 | 32.2 | 0.61 | (0.36-1.03) | 0.066 | 136 | 55.0 | 0.47 (0.29-0.79) | 0.004 |
| MIS-physical comorbidity | 157 | 36 | 16.4 | 1.00 | 88 | 42.3 | 0.63 | (0.39-1.03) | 0.066 | 100 | 41.3 | 0.28 (0.17-0.46) | <0.001 |
| | | | | | | | ***Stressful life events (S1+S2)*** | | | | | | |
| | | *0-2[c]* | | | | | *3-5* | | | | | *6 or more* | |
| No MIS | 745 | 142 | 20.4 | | 355 | 48.3 | 1.00 | | | 226 | 31.3 | 1.00 | |
| Non-comorbid MIS | 145 | 20 | 14.4 | 1.00 | 57 | 42.5 | 1.25 | (0.71-2.21) | 0.441 | 60 | 43.1 | 1.95[b] (1.11-3.44) | 0.021 |
| MIS-physical comorbidity | 157 | 9 | 6.3 | 1.00 | 43 | 29.5 | 1.97 | (0.94-4.15) | 0.073 | 101 | 64.2 | 6.62[b] (3.23-13.57) | <0.001 |
| | | | | | | | ***Would seek help for serious emotional problem (S2)*** | | | | | | |
| | | Definitely/Probably | | | | | Probably not/definitely not | | | | | | |
| No MIS | 745 | 599 | 80.7 | | 143 | 19.3 | 1.00 | | | | | | |
| Non-comorbid MIS | 145 | 117 | 78.8 | 1.00 | 28 | 21.2 | 1.02 | (0.94-1.10) | 0.623 | | | | |
| MIS-physical comorbidity | 157 | 131 | 83.0 | 1.00 | 25 | 17.0 | 0.98 | (0.91-1.05) | 0.518 | | | | |
| | | | | | | | ***Would feel comfortable talking about personal problems with professional (S2)*** | | | | | | |

| | | *Definitely/Probably* | | | *Probably not/definitely not* | | | |
|---|---|---|---|---|---|---|---|---|
| No MIS | 745 | 628 | 84.0 | | 114 | 16.0 | 1.00 | |
| Non-comorbid MIS | 145 | 128 | 88.6 | | 17 | 11.4 | 0.96 (0.90-1.01) | 0.115 |
| MIS-physical comorbidity | 157 | 134 | 86.1 | | 22 | 13.9 | 0.98 (0.92-1.04) | 0.505 |
| | | ***Would feel embarrassed if friends knew about help-seeking for emotional problem (S2)*** | | | | | | |
| | | *Probably not/definitely not* | | | *Definitely/Probably* | | | |
| No MIS | 745 | 542 | 74.1 | | 196 | 25.9 | 1.00 | |
| Non-comorbid MIS | 145 | 105 | 73.6 | 1.00 | 40 | 26.4 | 1.00 (0.92-1.09) | 0.913 |
| MIS-physical comorbidity | 157 | 116 | 75.0 | 1.00 | 40 | 25.0 | 0.99 (0.92-1.07) | 0.809 |
| | | ***Effectiveness perceptions of mental health treatments (S2)*** | | | | | | |
| | | *Low*[c] | | | *Moderate* | | | |
| No MIS | 745 | 119 | 15.7 | | 317 | 43.1 | 1.00 | |
| Non-comorbid MIS | 145 | 25 | 19.4 | 1.00 | 64 | 42.7 | 0.80 (0.48-1.36) | 0.411 |
| MIS-physical comorbidity | 157 | 41 | 26.0 | 1.00 | 54 | 33.1 | 0.47 (0.29-0.75) | 0.002 |

| | | *High* | | | |
|---|---|---|---|---|---|
| No MIS | 307 | 41.2 | 1.00 | |
| Non-comorbid MIS | 56 | 37.9 | 0.75 (0.43-1.28) | 0.290 |
| MIS-physical comorbidity | 62 | 40.9 | 0.60 (0.38-0.95) | 0.031 |

RRR, relative risk ratio; OR, odds ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure; (S2), S2 measure

Counts are unweighted; row percentages are weighted to account for clustering, non-response, changes in household structure from S1 to S2, and attrition.

[a] Regression analyses are logistic regressions, with the exception of social network size, stressful life events and effectiveness perceptions which were tested in multinomial regression models. [b] The contrasts between the non-comorbid MIS and the MIS-physical comorbidity groups were significant at $p<0.05$ [c] Represents the base category in the multinomial regression.

Table B10 Unadjusted associations between explanatory factors and 12-month mental health service use (S2) (N=1052)

| | No MHSU (n=884) | | | Primary MHSU only (n=75) | | | | | Secondary MHSU[a] (n=75) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR | (95% CI) | *p* | n | % | RRR | (95% CI) | *p* |
| ***MIS (S2)*** | | | | | | | | | | | | | |
| No MIS | 734 | 93.7 | | 23 | 3.1 | 1.00 | | | 25 | 3.2 | 1.00 | | |
| MIS | 151 | 61.2 | 1.00 | 52 | 20.3 | 9.89 | (5.78-16.92) | <0.001 | 50 | 18.5 | 8.92 | (5.23-15.23) | <0.001 |
| ***Gender (S1)*** | | | | | | | | | | | | | |
| Male | 382 | 87.9 | 1.00 | 20 | 5.0 | 1.00 | | | 31 | 7.1 | 1.00 | | |
| Female | 503 | 84.0 | | 55 | 8.9 | 1.85 | (1.09-3.15) | 0.023 | 44 | 7.1 | 1.14 | (0.71-1.82) | 0.599 |
| ***Age (S1)*** | | | | | | | | | | | | | |
| 16-29 | 270 | 87.3 | 1.00 | 19 | 6.7 | 1.00 | | | 19 | 6.0 | 1.00 | | |
| 30-39 | 178 | 83.6 | 1.00 | 20 | 10.1 | 1.52 | (0.78-2.97) | 0.216 | 13 | 6.4 | 1.11 | (0.53-2.33) | 0.774 |
| 40-49 | 167 | 81.8 | 1.00 | 14 | 8.0 | 1.18 | (0.56-2.53) | 0.660 | 20 | 10.1 | 1.68 | (0.85-3.31) | 0.134 |
| 50-59 | 123 | 78.5 | 1.00 | 15 | 10.4 | 1.62 | (0.78-3.38) | 0.197 | 17 | 11.1 | 1.93 | (0.91-4.09) | 0.087 |
| 60 or over | 147 | 91.8 | | 7 | 4.1 | 0.53 | (0.21-1.32) | 0.173 | 6 | 4.1 | 0.61 | (0.23-1.62) | 0.316 |
| ***Relationship status (S1)*** | | | | | | | | | | | | | |
| Married/cohabitating | 448 | 86.5 | 1.00 | 37 | 8.1 | 1.00 | | | 27 | 5.4 | 1.00 | | |
| Single | 313 | 85.0 | 1.00 | 28 | 7.4 | 0.97 | (0.56-1.66) | 0.903 | 29 | 7.5 | 1.52 | (0.85-2.73) | 0.160 |
| Previously in relationship | 124 | 82.6 | | 10 | 6.4 | 0.76 | (0.35-1.61) | 0.470 | 19 | 11.1 | 2.20 | (1.12-4.31) | 0.022 |
| ***Ethnicity (S1)*** | | | | | | | | | | | | | |
| White | 575 | 84.7 | 1.00 | 42 | 6.4 | 1.00 | | | 59 | 8.9 | 1.00 | | |
| Black Caribbean | 69 | 89.5 | 1.00 | 7 | 8.5 | 1.44 | (0.62-3.39) | 0.397 | 2 | 2.0 | 0.26 | (0.06-1.10) | 0.066 |
| Black African | 114 | 86.9 | 1.00 | 12 | 10.3 | 1.64 | (0.79-3.39) | 0.181 | 4 | 2.9 | 0.35 | (0.12-1.01) | 0.052 |
| Other | 126 | 84.1 | | 14 | 10.0 | 1.63 | (0.87-3.04) | 0.128 | 10 | 5.9 | 0.72 | (0.35-1.48) | 0.375 |
| ***Migrant (S1)*** | | | | | | | | | | | | | |
| UK born | 573 | 87.2 | 1.00 | 34 | 5.2 | 1.00 | | | 50 | 7.6 | 1.00 | | |
| <10 years in the UK | 137 | 84.5 | 1.00 | 16 | 10.9 | 2.15 | (1.15-4.04) | 0.017 | 8 | 4.6 | 0.64 | (0.27-1.55) | 0.324 |
| ≥10 years in the UK | 154 | 78.5 | | 24 | 13.0 | 2.70 | (1.50-4.86) | <0.001 | 17 | 8.5 | 1.20 | (0.65-2.20) | 0.561 |
| ***Education (S1+S2)*** | | | | | | | | | | | | | |
| No qualifications | 107 | 88.2 | | 8 | 5.8 | 0.83 | (0.33-2.05) | 0.680 | 8 | 6.0 | 1.01 | (0.42-2.44) | 0.976 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GCSE | 163 | 85.9 | 1.00 | 13 | 6.6 | 0.98 | (0.47-2.04) | 0.950 | 17 | 7.5 | 0.91 | (0.45-1.86) | 0.804 |
| A-level | 206 | 81.3 | 1.00 | 26 | 11.3 | 2.01 | (1.16-3.47) | 0.012 | 18 | 7.5 | 0.88 | (0.47-1.65) | 0.693 |
| Degree or above | 399 | 86.3 | 1.00 | 28 | 6.7 | 1.00 | | | 31 | 7.0 | 1.00 | | |
| ***Adverse employment conditions[b] (S1+S2)*** | | | | | | | | | | | | | |
| No | 722 | 88.2 | | 47 | 6.0 | 1.00 | | | 49 | 5.8 | 1.00 | | |
| Yes | 159 | 74.6 | 1.00 | 28 | 13.3 | 2.62 | (1.55-4.43) | <0.001 | 26 | 12.1 | 2.47 | (1.46-4.18) | <0.001 |
| ***Low household income[c] (S1+S2)*** | | | | | | | | | | | | | |
| No | 586 | 86.7 | | 47 | 7.5 | 1.00 | | | 40 | 5.8 | 1.00 | | |
| Yes | 132 | 80.4 | 1.00 | 13 | 8.1 | 1.17 | (0.61-2.25) | 0.628 | 20 | 11.5 | 2.15 | (1.19-3.88) | 0.012 |
| ***Chronic debt (S1+S2)*** | | | | | | | | | | | | | |
| No | 821 | 86.6 | | 62 | 6.9 | 1.00 | | | 62 | 6.5 | 1.00 | | |
| Yes | 56 | 73.4 | 1.00 | 12 | 15.8 | 2.68 | (1.36-5.29) | 0.005 | 9 | 10.9 | 1.98 | (0.91-4.28) | 0.084 |
| ***Benefits[d] (S1+S2)*** | | | | | | | | | | | | | |
| No | 665 | 87.7 | | 44 | 6.1 | 1.00 | | | 46 | 6.1 | 1.00 | | |
| Yes | 214 | 78.5 | 1.00 | 31 | 11.5 | 2.10 | (1.29-3.44) | 0.003 | 29 | 10.0 | 1.82 | (1.10-3.02) | 0.020 |
| ***Social support (S1)*** | | | | | | | | | | | | | |
| Low | 149 | 82.0 | | 17 | 9.1 | 1.00 | | | 18 | 8.9 | 1.00 | | |
| High | 724 | 86.2 | 1.00 | 56 | 7.0 | 0.73 | (0.41-1.30) | 0.289 | 56 | 6.7 | 0.72 | (0.41-1.28) | 0.268 |
| ***Social network size (S1)*** | | | | | | | | | | | | | |
| 2 or less | 64 | 84.9 | | 7 | 8.0 | 1.00 | | | 7 | 7.1 | 1.00 | | |
| 3-4 | 235 | 83.7 | 1.00 | 21 | 8.0 | 1.01 | (0.40-2.55) | 0.978 | 23 | 8.4 | 1.19 | (0.49-2.89) | 0.704 |
| 5 or more | 581 | 86.3 | 1.00 | 45 | 7.0 | 0.87 | (0.37-2.04) | 0.744 | 45 | 6.7 | 0.92 | (0.39-2.19) | 0.846 |
| ***Stressful life events (S1+S2)*** | | | | | | | | | | | | | |
| 0-2 | 151 | 88.9 | | 10 | 5.6 | 1.00 | | | 9 | 5.5 | 1.00 | | |
| 3-5 | 394 | 87.3 | 1.00 | 30 | 6.9 | 1.26 | (0.60-2.65) | 0.539 | 27 | 5.8 | 1.07 | (0.48-2.37) | 0.863 |
| 6 or more | 308 | 81.0 | 1.00 | 33 | 9.2 | 1.81 | (0.87-3.77) | 0.113 | 38 | 9.8 | 1.96 | (0.89-4.30) | 0.096 |
| ***Treatment effectiveness perceptions (S2)*** | | | | | | | | | | | | | |
| Low | 157 | 85.1 | | 16 | 8.6 | 1.00 | | | 11 | 6.3 | 1.00 | | |
| Moderate | 372 | 86.1 | 1.00 | 30 | 7.5 | 0.86 | (0.44-1.70) | 0.663 | 30 | 6.5 | 1.01 | (0.48-2.15) | 0.976 |
| High | 355 | 84.5 | 1.00 | 29 | 7.3 | 0.85 | (0.44-1.67) | 0.644 | 34 | 8.2 | 1.32 | (0.63-2.76) | 0.467 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures
"No service use" represents the base category in the multinomial regression.
[a] Includes those who reported use of primary, as well as secondary services. [b] Working aged (<65) persons moving or persistently out of employment or education between S1 and S2. [c] A sharp decline in household income or persistently low household income between S1 and S2. [d] Benefits are non-health related

Table B11 Block-adjusted models of longitudinal associations of comorbidity and mental health service use (S2), adjusting for of socio-demographic, socio-economic and psychosocial factors (N=1052)

| | **No MHSU (n=884)** | **Primary MHSU only (n=75)** | | **Secondary MHSU[a] (n=75)** | |
|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Block-adjusted socio-demographic model*** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No MIS | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.53 (0.72-3.23) | 0.266 | 1.82 (0.89-3.76) | 0.103 |
| MIS-physical comorbidity | 1.00 | 6.84 (3.77-12.38) | <0.001 | 6.35 (3.69-10.92) | <0.001 |
| ***Gender (S1)*** | 1.00 | 1.56 (0.88-2.74) | 0.125 | 1.01 (0.61-1.68) | 0.963 |
| ***Age (continuous) (S1)*** | 1.00 | 0.98 (0.97-1.00) | 0.024 | 0.99 (0.97-1.00) | 0.058 |
| ***Ethnicity (S1)*** | 1.00 | 1.04 (0.57-1.89) | 0.900 | 0.40 (0.19-0.82) | 0.012 |
| ***Migrant (S1)*** | | | | | |
| UK born | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.85 (0.94-3.66) | 0.075 | 0.82 (0.32-2.13) | 0.687 |
| ≥10 years in the UK | 1.00 | 2.63 (1.30-5.34) | 0.007 | 1.70 (0.82-3.50) | 0.152 |
| ***Block-adjusted socio-economic model*** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.17 (0.47-2.88) | 0.734 | 2.20 (1.01-4.82) | 0.049 |
| MIS-physical comorbidity | 1.00 | 6.19 (3.29-11.62) | <0.001 | 5.77 (3.01-11.07) | <0.001 |
| ***Education (S1+S2)*** | | | | | |
| No qualifications | 1.00 | 0.51 (0.16-1.66) | 0.263 | 0.28 (0.09-0.85) | 0.025 |
| GCSE | 1.00 | 0.87 (0.33-2.28) | 0.777 | 0.49 (0.21-1.18) | 0.112 |
| A-level | 1.00 | 1.80 (0.95-3.41) | 0.072 | 0.44 (0.19-1.03) | 0.058 |
| Degree or above | | 1.00 | | 1.00 | |
| ***Adverse employment conditions (S1/S1)[a]*** | 1.00 | 1.54 (0.74-3.22) | 0.247 | 1.58 (0.85-2.96) | 0.149 |

| | | | | | |
|---|---|---|---|---|---|
| ***Low household income (S1+S2)[b]*** | 1.00 | 0.53 (0.24-1.16) | 0.113 | 1.55 (0.80-3.01) | 0.192 |
| ***Benefits receipt (S1+S2)[c]*** | 1.00 | 1.68 (0.89-3.17) | 0.110 | 1.38 (0.70-2.75) | 0.355 |
| ***Block-adjusted psychosocial model*** | | | | | |
| ***Comorbidity (S1)*** | | | | | |
| No illness | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 1.77 (0.86-3.64) | 0.120 | 1.93 (0.94-3.97) | 0.073 |
| MIS-physical comorbidity | 1.00 | 6.32 (3.55-11.26) | <0.001 | 6.09 (3.19-11.60) | <0.001 |
| ***High social support (S1)*** | 1.00 | 1.02 (0.55-1.88) | 0.962 | 1.00 (0.53-1.89) | 0.997 |
| ***Social network size (S1)*** | | | | | |
| 2 or less contacts | | 1.00 | | 1.00 | |
| 3-4 contacts | 1.00 | 1.20 (0.46-3.19) | 0.708 | 1.39 (0.55-3.55) | 0.485 |
| 5 or more contacts | 1.00 | 1.32 (0.52-3.36) | 0.554 | 1.40 (0.56-3.51) | 0.478 |
| ***Stressful life events (S1+S2)*** | | | | | |
| 0-2 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 1.14 (0.54-2.41) | 0.723 | 0.97 (0.44-2.15) | 0.941 |
| 6 or more | 1.00 | 1.15 (0.54-2.47) | 0.720 | 1.22 (0.53-2.82) | 0.634 |

MHSU, mental health service use; RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms
"No MHSU" represents the base category in the multinomial regression.
[a] Move out of or persistently out of employment or education in working age (<65). [b] A sharp decline in household income or persistently low household income. [c] Benefits are non-health related

Table B12 Prevalence distribution of mental health service use patterns by sociodemographic, socio-economic, psychosocial and attitudinal factors

| | No MHSU (n=785) | | Discontinued MHSU (n=99) | | S2 initiated MHSU (n=81) | | Continuous MHSU (n=87) | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| ***Gender (S1)*** | | | | | | | | |
| Male | 348 | 79.0 | 34 | 7.7 | 25 | 5.6 | 32 | 7.7 |
| Female | 437 | 71.6 | 65 | 10.7 | 56 | 8.9 | 55 | 8.8 |
| ***Age (S1)*** | | | | | | | | |
| 16-29 | 233 | 72.9 | 37 | 12.7 | 20 | 6.8 | 23 | 7.5 |
| 30-39 | 158 | 72.9 | 20 | 9.3 | 21 | 10.2 | 16 | 7.6 |
| 40-49 | 151 | 72.2 | 15 | 7.5 | 17 | 8.3 | 22 | 12.1 |
| 50-59 | 107 | 66.5 | 16 | 10.9 | 13 | 8.3 | 21 | 14.3 |
| 60 or over | 136 | 84.2 | 11 | 6.5 | 10 | 6.2 | 5 | 3.1 |
| ***Relationship status (S1)*** | | | | | | | | |
| Married/cohabitating | 401 | 75.7 | 46 | 8.9 | 43 | 8.7 | 31 | 6.7 |
| Single | 273 | 72.0 | 40 | 11.8 | 27 | 6.8 | 36 | 9.4 |
| Previously in relationship | 111 | 74.0 | 13 | 7.6 | 11 | 7.2 | 20 | 11.3 |
| ***Ethnicity (S1)*** | | | | | | | | |
| White | 503 | 72.7 | 71 | 10.5 | 56 | 8.3 | 58 | 8.5 |
| Black Caribbean | 62 | 78.4 | 7 | 9.6 | 4 | 4.1 | 6 | 7.9 |
| Black African | 104 | 77.5 | 10 | 8.7 | 8 | 6.0 | 9 | 7.8 |
| Other | 116 | 75.6 | 10 | 6.5 | 13 | 9.0 | 14 | 8.9 |
| ***Migrant (S1)*** | | | | | | | | |
| UK born | 505 | 75.2 | 67 | 10.4 | 47 | 7.1 | 49 | 7.3 |
| <10 years in the UK | 120 | 72.6 | 17 | 10.7 | 11 | 6.6 | 15 | 10.1 |
| ≥10 years in the UK | 141 | 70.6 | 13 | 6.5 | 22 | 10.9 | 23 | 12.0 |
| ***Education (S1+S2)*** | | | | | | | | |
| No qualifications | 74 | 81.9 | 3 | 3.4 | 5 | 5.3 | 10 | 9.4 |
| GCSE | 120 | 72.3 | 22 | 13.6 | 12 | 6.1 | 14 | 8.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A-level | 186 | 69.0 | 26 | 11.0 | 22 | 9.1 | 28 | 10.9 |
| Degree or above | 406 | 75.9 | 48 | 8.9 | 41 | 8.1 | 35 | 7.1 |
| ***Adverse employment conditions[a] (S1+S2)*** | | | | | | | | |
| No | 651 | 78.7 | 71 | 8.7 | 55 | 6.6 | 49 | 6.0 |
| Yes | 132 | 59.0 | 27 | 12.9 | 24 | 11.2 | 38 | 16.9 |
| ***Low household income[b] (S1+S2)*** | | | | | | | | |
| No | 526 | 76.6 | 60 | 9.3 | 50 | 7.6 | 44 | 6.6 |
| Yes | 109 | 65.0 | 23 | 13.3 | 12 | 6.9 | 25 | 14.7 |
| ***Chronic debt (S1+S2)*** | | | | | | | | |
| No | 730 | 75.4 | 91 | 9.7 | 69 | 7.3 | 71 | 7.6 |
| Yes | 48 | 60.4 | 8 | 11.6 | 9 | 11.2 | 13 | 16.7 |
| ***Benefits[c] (S1+S2)*** | | | | | | | | |
| No | 597 | 77.6 | 68 | 8.9 | 55 | 7.3 | 46 | 6.2 |
| Yes | 184 | 64.8 | 30 | 11.8 | 25 | 8.9 | 41 | 14.4 |
| ***Social support (S1)*** | | | | | | | | |
| Low | 129 | 69.4 | 20 | 11.3 | 14 | 7.4 | 24 | 11.9 |
| High | 645 | 75.1 | 79 | 9.5 | 66 | 7.9 | 61 | 7.5 |
| ***Social network size (S1)*** | | | | | | | | |
| 2 or less contacts | 50 | 65.1 | 14 | 18.8 | 5 | 5.1 | 10 | 11.1 |
| 3-4 contacts | 211 | 73.5 | 24 | 8.2 | 20 | 7.7 | 30 | 10.6 |
| 5 or more contacts | 520 | 75.7 | 61 | 9.4 | 54 | 8.0 | 46 | 6.9 |
| ***Stressful life events (S1+S2)*** | | | | | | | | |
| 0-2 | 140 | 81.9 | 11 | 6.5 | 16 | 8.9 | 4 | 2.7 |
| 3-5 | 359 | 77.9 | 35 | 8.2 | 34 | 7.5 | 29 | 6.3 |
| 6 or more | 261 | 66.6 | 47 | 12.2 | 28 | 7.5 | 53 | 13.7 |
| ***Treatment benefit perceptions (S2)*** | | | | | | | | |
| Low | 134 | 71.0 | 23 | 13.2 | 16 | 8.9 | 13 | 6.9 |
| Medium | 338 | 76.9 | 34 | 7.8 | 32 | 7.2 | 35 | 8.1 |
| High | 313 | 72.5 | 42 | 10.2 | 33 | 7.8 | 39 | 9.5 |

MHSU, mental health service use; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures

[a] Move out of or persistently out of employment or education in working age (<65). [b] A sharp decline in household income or persistently low household income. [c] Benefits are non-health related

Table B13 Unadjusted associations between explanatory factors and mental health service use patterns (N=1034)

| | No MHSU (n=785) | Discontinued MHSU (n=99) | | S2 initiated service use (n=81) | | Continuous MHSU (n=87) | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (96% CI) | *p* | RRR (96% CI) | *p* | RRR (96% CI) | *p* |
| ***MIS (S2)*** | 1.00 | 3.87 (2.39-6.27) | <0.001 | 7.49 (4.51-12.43) | <0.001 | 15.69 (9.15-26.89) | <0.001 |
| **Socio-demographic factors** | | | | | | | |
| ***Female (S1)*** | 1.00 | 1.54 (0.98-2.42) | 0.063 | 1.76 (1.07-2.91) | 0.027 | 1.27 (0.80-2.01) | 0.316 |
| ***Age (S1)*** | | | | | | | |
| 16-29 | | 1.00 | | 1.00 | | 1.00 | |
| 30-39 | 1.00 | 0.73 (0.41-1.32) | 0.303 | 1.49 (0.77-2.89) | 0.236 | 1.02 (0.51-2.03) | 0.963 |
| 40-49 | 1.00 | 0.59 (0.31-1.14) | 0.116 | 1.23 (0.60-2.55) | 0.572 | 1.63 (0.86-3.07) | 0.134 |
| 50-59 | 1.00 | 0.94 (0.49-1.79) | 0.845 | 1.34 (0.62-2.86) | 0.457 | 2.08 (1.08-4.02) | 0.028 |
| 60 or over | 1.00 | 0.44 (0.22-0.90) | 0.025 | 0.79 (0.35-1.76) | 0.559 | 0.36 (0.13-1.01) | 0.053 |
| ***Relationship status (S1)*** | 1.00 | | | | | | |
| Married/cohabitating | 1.00 | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.00 | 1.40 (0.87-2.26) | 0.170 | 0.82 (0.48-1.40) | 0.476 | 1.48 (0.87-2.50) | 0.148 |
| Previously in relationship | | 0.87 (0.45-1.71) | 0.695 | 0.84 (0.41-1.73) | 0.634 | 1.72 (0.92-3.22) | 0.087 |
| ***Ethnicity (S1)*** | | | | | | | |
| White | | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.00 | 0.85 (0.37-1.94) | 0.697 | 0.46 (0.16-1.32) | 0.147 | 0.86 (0.36-2.05) | 0.730 |
| Black African | 1.00 | 0.77 (0.35-1.68) | 0.517 | 0.67 (0.30-1.49) | 0.329 | 0.86 (0.41-1.80) | 0.690 |
| Other | 1.00 | 0.60 (0.30-1.16) | 0.129 | 1.03 (0.56-1.92) | 0.913 | 1.01 (0.54-1.87) | 0.985 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.07 (0.59-1.93) | 0.828 | 0.96 (0.48-1.91) | 0.911 | 1.43 (0.76-2.70) | 0.268 |
| ≥10 years in the UK | 1.00 | 0.66 (0.35-1.25) | 0.205 | 1.63 (0.93-2.86) | 0.086 | 1.75 (1.00-3.04) | 0.048 |
| **Socio-economic factors** | | | | | | | |
| ***Education (S1+S2)*** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No qualifications | 1.00 | 0.36 (0.11-1.19) | 0.094 | 0.61 (0.22-1.64) | 0.324 | 1.23 (0.57-2.65) | 0.589 |
| GCSE | 1.00 | 1.60 (0.94-2.71) | 0.082 | 0.79 (0.39-1.60) | 0.515 | 1.18 (0.61-2.30) | 0.625 |
| A-level | 1.00 | 1.35 (0.81-2.26) | 0.249 | 1.24 (0.70-2.18) | 0.457 | 1.70 (0.99-2.90) | 0.052 |
| Degree or above | | 1.00 | | 1.00 | | 1.00 | |
| ***Adverse employment conditions[a] (S1+S2)*** | 1.00 | 1.97 (1.21-3.22) | 0.007 | 2.27 (1.34-3.84) | 0.002 | 3.72 (2.31-5.99) | <0.001 |
| ***Low household income[b] (S1+S2)*** | 1.00 | 1.69 (0.98-2.90) | 0.057 | 1.07 (0.55-2.11) | 0.836 | 2.64 (1.53-4.56) | <0.001 |
| ***Chronic debt (S1+S2)*** | 1.00 | 1.49 (0.70-3.19) | 0.301 | 1.92 (0.89-4.16) | 0.095 | 2.74 (1.40-5.36) | 0.003 |
| ***Benefits[c] (S1+S2)*** | 1.00 | 1.58 (0.99-2.53) | 0.057 | 1.47 (0.88-2.46) | 0.143 | 2.77 (1.73-4.43) | <0.001 |
| **Social factors** | | | | | | | |
| ***High social support (S1)*** | 1.00 | 0.78 (0.46-1.32) | 0.350 | 0.99 (0.53-1.84) | 0.965 | 0.58 (0.34-0.99) | 0.045 |
| ***Social network size (S1)*** | | | | | | | |
| 2 or less contacts | | 1.00 | | 1.00 | | 1.00 | |
| 3-4 contacts | 1.00 | 0.39 (0.18-0.83) | 0.014 | 1.34 (0.46-3.93) | 0.589 | 0.85 (0.39-1.88) | 0.687 |
| 5 or more contacts | 1.00 | 0.43 (0.22-0.84) | 0.014 | 1.35 (0.50-3.70) | 0.555 | 0.54 (0.25-1.15) | 0.112 |
| ***Stressful life events (S1+S2)*** | | | | | | | |
| 0-2 | | 1.00 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 1.33 (0.66-2.71) | 0.425 | 0.88 (0.46-1.67) | 0.699 | 2.45 (0.82-7.32) | 0.107 |
| 6 or more | 1.00 | 2.31 (1.17-4.54) | 0.016 | 1.04 (0.53-2.02) | 0.912 | 6.22 (2.14-18.04) | <0.001 |
| **Attitudinal factors** | | | | | | | |
| ***Treatment benefit perceptions (S2)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 0.55 (0.30-0.99) | 0.045 | 0.74 (0.38-1.46) | 0.390 | 1.08 (0.54-2.15) | 0.823 |
| High | 1.00 | 0.75 (0.42-1.34) | 0.339 | 0.86 (0.44-1.67) | 0.656 | 1.34 (0.69-2.64) | 0.389 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures
"No service use" represents the base category in the multinomial regression.
[a] Working aged (<65) persons moving or persistently out of employment or education between S1 and S2. [b] A sharp decline in household income or persistently low household income between S1 and S2. [c] Benefits are non-health related

Table B14 Block-adjusted models of longitudinal associations of comorbidity and mental health service use patterns, adjusting for of socio-demographic, socio-economic and psychosocial factors (N=1052)

| | **No MHSU (n=785)** | **Discontinued MHSU at S2 (n=99)** | | **S2 initiated MHSU (n=81)** | | **Continuous MHSU (n=87)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Block-adjusted socio-demographic model*** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No MIS | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 5.36 (3.17-9.05) | <0.001 | 1.55 (0.75-3.22) | 0.236 | 3.12 (1.56-6.28) | <0.001 |
| MIS-physical comorbidity | 1.00 | 3.57 (1.88-6.79) | <0.001 | 3.94 (2.19-7.09) | <0.001 | 13.94 (7.82-24.86) | <0.001 |
| ***Gender (S1)*** | 1.00 | 1.43 (0.88-2.33) | 0.153 | 1.64 (0.98-2.76) | 0.061 | 1.07 (0.65-1.76) | 0.783 |
| ***Age (continuous) (S1)*** | 1.00 | 0.99 (0.97-1.00) | 0.145 | 0.99 (0.97-1.00) | 0.070 | 0.98 (0.97-1.00) | 0.010 |
| ***Ethnicity (S1 )*** | 1.00 | 0.67 (0.39-1.15) | 0.148 | 0.63 (0.35-1.13) | 0.118 | 0.70 (0.38-1.28) | 0.249 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.08 (0.56-2.09) | 0.822 | 1.04 (0.49-2.18) | 0.920 | 1.56 (0.78-3.13) | 0.210 |
| ≥10 years in the UK | 1.00 | 0.87 (0.45-1.70) | 0.684 | 2.08 (1.07-4.05) | 0.031 | 1.79 (0.89-3.60) | 0.100 |
| ***Block-adjusted socio-economic model*** | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | |
| No illness | | 1.00 | | 1.00 | | 1.00 | |
| Non-comorbid MIS | 1.00 | 4.18 (2.31-7.56) | <0.001 | 1.66 (0.76-3.62) | 0.200 | 2.70 (1.14-6.37) | 0.024 |
| MIS-physical comorbidity | 1.00 | 2.57 (1.23-5.38) | 0.012 | 3.67 (1.92-7.01) | <0.001 | 11.51 (5.97-22.16) | <0.001 |
| ***Education (S2)*** | | | | | | | |
| No qualifications | 1.00 | 0.17 (0.04-0.70) | 0.014 | 0.39 (0.12-1.22) | 0.106 | 0.24 (0.08-0.72) | 0.011 |
| GCSE | 1.00 | 1.30 (0.65-2.57) | 0.460 | 0.80 (0.34-1.86) | 0.598 | 0.58 (0.23-1.49) | 0.257 |
| A-level | 1.00 | 1.27 (0.68-2.40) | 0.455 | 1.06 (0.54-2.06) | 0.871 | 0.90 (0.44-1.83) | 0.769 |
| Degree or above | | 1.00 | | 1.00 | | 1.00 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Adverse employment conditions (S1/S1)[a]*** | 1.00 | 1.90 | (1.02-3.55) | 0.042 | 1.71 | (0.86-3.40) | 0.129 | 1.98 (1.05-3.74) | 0.034 |
| ***Low household income (S1+S2)[b]*** | 1.00 | 1.26 | (0.68-2.37) | 0.464 | 0.79 | (0.39-1.59) | 0.508 | 1.18 (0.58-2.41) | 0.647 |
| ***Benefits receipt (S1+S2)[c]*** | 1.00 | 1.18 | (0.63-2.20) | 0.612 | 1.12 | (0.57-2.18) | 0.741 | 2.07 (1.08-3.94) | 0.027 |
| ***Block-adjusted psychosocial model*** | | | | | | | | | |
| ***Comorbidity (S1)*** | | | | | | | | | |
| No illness | | 1.00 | | | 1.00 | | | 1.00 | |
| Non-comorbid MIS | 1.00 | 5.73 | (3.36-9.75) | <0.001 | 1.66 | (0.80-3.43) | 0.171 | 3.56 (1.77-7.13) | <0.001 |
| MIS-physical comorbidity | 1.00 | 3.33 | (1.76-6.32) | <0.001 | 4.45 | (2.43-8.14) | <0.001 | 10.37 (5.54-19.39) | <0.001 |
| ***Social support (S1)*** | 1.00 | 1.08 | (0.61-1.93) | 0.786 | 1.17 | (0.60-2.28) | 0.650 | 1.00 (0.56-1.81) | 0.993 |
| ***Social network size (S1)*** | | | | | | | | | |
| 2 or less contacts | | 1.00 | | | 1.00 | | | 1.00 | |
| 3-4 contacts | 1.00 | 0.39 | (0.17-0.88) | 0.024 | 1.31 | (0.44-3.88) | 0.629 | 1.07 (0.44-2.59) | 0.883 |
| 5 or more contacts | 1.00 | 0.54 | (0.25-1.15) | 0.108 | 1.61 | (0.58-4.50) | 0.360 | 0.99 (0.41-2.36) | 0.973 |
| ***Stressful life events (S1+S2)*** | | | | | | | | | |
| 0-2 | | 1.00 | | | 1.00 | | | 1.00 | |
| 3-5 | 1.00 | 1.25 | (0.60-2.61) | 0.556 | 0.85 | (0.44-1.62) | 0.619 | 2.10 (0.73-6.08) | 0.170 |
| 6 or more | 1.00 | 1.75 | (0.85-3.64) | 0.131 | 0.80 | (0.41-1.58) | 0.518 | 3.40 (1.15-10.02) | 0.027 |

MHSU, mental health service use; RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms

"No MHSU" represents the base category in the multinomial regression.

[a] Move out of or persistently out of employment or education in working age (<65). [b] A sharp decline in household income or persistently low household income. [c] Benefits are non-health related

## Appendix C

Table C1 Associations between health-related factors and comorbidity

| | No MIS (n=743) | | | Non-comorbid MIS (n=145) | | | | | MIS-physical comorbidity (n=157) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | RRR | n | % | RRR | (95% CI) | *p* | n | % | RRR | (95% CI) | *p* |
| ***Somatic symptom severity (S1+S2)*** | | | | | | | | | | | | | |
| Low | 426 | 89.7 | | 38 | 8.0 | 1.00 | | | 11 | 2.3 | 1.00 | | |
| Moderate | 240 | 67.3 | 1.00 | 65 | 18.0 | 2.98 | (1.91-4.66) | <0.001 | 50 | 14.8 | 8.56 | (4.26-17.21) | <0.001 |
| High | 74 | 34.9 | 1.00 | 42 | 19.9 | 6.36 | (3.73-10.84) | <0.001 | 95 | 45.2 | 50.58 | (25.02-102.24) | <0.001 |
| ***Self-rated health (S1+S2)*** | | | | | | | | | | | | | |
| Good/Very good/ excellent | 626 | 79.4 | | 106 | 14.2 | | | | 50 | 6.4 | 1.00 | | |
| Fair/poor | 114 | 43.6 | 1.00 | 39 | 13.8 | 1.78 | (1.16-2.72) | 0.009 | 106 | 42.6 | 12.09 | (8.04-18.18) | <0.001 |
| ***Daily functioning problems (S1+S2)*** | | | | | | | | | | | | | |
| None | 690 | 73.9 | | 126 | 14.0 | 1.00 | | | 107 | 12.0 | 1.00 | | |
| Any | 32 | 36.4 | 1.00 | 11 | 11.2 | 1.63 | (0.78-3.40) | 0.195 | 46 | 52.4 | 8.86 | (5.35-14.69) | <0.001 |

MIS, mental illness symptoms; RRR, relative risk ratio; CI, confidence interval; (S1), S1 measure; (S2), S2 measure; (S1+S2), derived variable from S1 and S2 measures
"No MIS" represents the base category in the multinomial regression.

Table C2 Distribution of socio-demographic, socio-economic, health-related, and psychosocial factors by employment/education trajectories

| | Stable employment/ education (n=641) | | Transition into employment/ education (n=56) | | Transition out of employment/ education (n=89) | | Persistently out of employment/ education (n=132) | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| ***Gender (S1)*** | | | | | | | | |
| Male | 290 | 73.4 | 17 | 5.2 | 27 | 7.3 | 45 | 14.1 |
| Female | 351 | 63.0 | 39 | 7.5 | 62 | 11.7 | 87 | 17.8 |
| ***Age (S1)*** | | | | | | | | |
| 16-29 | 232 | 72.0 | 22 | 8.0 | 39 | 13.0 | 19 | 7.0 |
| 30-39 | 165 | 74.3 | 12 | 6.5 | 18 | 9.1 | 19 | 10.2 |
| 40-49 | 147 | 69.0 | 13 | 7.0 | 13 | 6.1 | 31 | 18.0 |
| 50-59 | 85 | 51.7 | 7 | 4.3 | 15 | 10.5 | 48 | 33.5 |
| 60 or older | 12 | 30.8 | 2 | 7.1 | 4 | 11.6 | 15 | 50.5 |
| ***Relationship status (S1)*** | | | | | | | | |
| Married/cohabitating | 325 | 68.7 | 27 | 6.8 | 35 | 8.3 | 62 | 16.3 |
| Single | 255 | 68.4 | 22 | 6.8 | 44 | 12.6 | 41 | 12.1 |
| Previously in relationship | 61 | 51.7 | 7 | 6.5 | 10 | 9.8 | 29 | 32.0 |
| ***Ethnicity (S1 )*** | | | | | | | | |
| White | 417 | 67.4 | 33 | 6.2 | 46 | 8.1 | 92 | 18.3 |
| Black Caribbean | 44 | 61.3 | 9 | 14.1 | 10 | 13.1 | 7 | 11.4 |
| Black African | 84 | 66.3 | 7 | 6.2 | 18 | 17.0 | 11 | 10.5 |
| Other | 96 | 65.7 | 7 | 5.9 | 15 | 11.7 | 21 | 16.7 |
| ***Migrant (S1)*** | | | | | | | | |
| UK born | 418 | 68.4 | 29 | 5.5 | 53 | 9.5 | 84 | 16.7 |
| <10 years in the UK | 113 | 68.7 | 11 | 8.0 | 19 | 13.1 | 14 | 10.2 |
| ≥10 years in the UK | 96 | 55.8 | 14 | 9.4 | 17 | 11.5 | 33 | 23.2 |
| ***Somatic symptom severity (S1)*** | | | | | | | | |
| Low | 420 | 75.0 | 33 | 6.8 | 46 | 9.0 | 43 | 9.1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Moderate | 172 | 65.5 | 9 | 3.6 | 28 | 11.4 | 43 | 19.5 |
| High | 49 | 36.6 | 13 | 12.1 | 14 | 11.8 | 45 | 39.5 |
| ***Self-rated health (S1)*** | | | | | | | | |
| Good/Very good/ excellent | 572 | 72.1 | 47 | 6.8 | 71 | 9.8 | 77 | 11.3 |
| Fair/poor | 69 | 41.2 | 9 | 6.7 | 17 | 11.6 | 54 | 40.5 |
| ***Perceived functioning limitations due to emotional health (S1)*** | | | | | | | | |
| No | 564 | 71.4 | 44 | 6.4 | 59 | 8.1 | 92 | 14.1 |
| Yes | 77 | 46.1 | 11 | 8.3 | 29 | 19.2 | 38 | 26.5 |
| ***Daily functioning problems (S1)*** | | | | | | | | |
| None | 629 | 69.5 | 51 | 6.6 | 84 | 10.3 | 105 | 13.6 |
| Any | 12 | 22.0 | 4 | 8.7 | 4 | 6.6 | 26 | 62.6 |
| ***Social support (S1)*** | | | | | | | | |
| Low | 73 | 43.7 | 16 | 12.2 | 14 | 9.5 | 46 | 34.5 |
| High | 563 | 71.2 | 39 | 5.6 | 74 | 10.3 | 84 | 12.8 |
| ***Social network size (S1)*** | | | | | | | | |
| 2 or less contacts | 20 | 29.1 | 7 | 11.8 | 5 | 7.7 | 30 | 51.4 |
| 3-4 contacts | 126 | 49.4 | 25 | 11.7 | 25 | 11.0 | 58 | 27.9 |
| 5 or more contacts | 495 | 77.7 | 23 | 4.1 | 58 | 10.0 | 43 | 8.2 |
| ***Stressful life events (S1)*** | | | | | | | | |
| 0-2 | 247 | 76.4 | 11 | 3.6 | 27 | 9.0 | 30 | 10.9 |
| 3-5 | 296 | 68.1 | 30 | 8.2 | 37 | 9.7 | 49 | 14.0 |
| 6 or more | 98 | 47.0 | 14 | 8.7 | 24 | 12.8 | 52 | 31.5 |

MIS, mental illness symptoms

Table C3 Unadjusted associations of socio-demographic, socio-economic, health-related, and psychosocial factors with employment/education trajectories

| | **Stable education or employment (n=641)** | **Move into education or employment (n=56)** | | **Move out of education or employment (n=89)** | | **Persistently out of education or employment (n=132)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Female gender (S1)*** | 1.00 | 1.70 (0.93-3.10) | 0.086 | 1.86 (1.16-2.98) | 0.010 | 1.48 (1.01-2.15) | 0.042 |
| ***Age (continuous) (S1)*** | 1.00 | 1.00 (0.98-1.02) | 0.876 | 1.00 (0.98-1.02) | 0.848 | 1.07 (1.05-1.09) | <0.001 |
| ***Relationship status (S1)*** | | | | | | | |
| Married/cohabitating | | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.00 | 1.01 (0.55-1.86) | 0.973 | 1.54 (0.93-2.54) | 0.093 | 0.75 (0.48-1.18) | 0.212 |
| Previously in relationship | 1.00 | 1.26 (0.52-3.06) | 0.605 | 1.58 (0.72-3.45) | 0.252 | 2.61 (1.52-4.49) | <0.001 |
| ***Ethnicity (S1 )*** | | | | | | | |
| White | | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.00 | 2.50 (1.09-5.73) | 0.030 | 1.77 (0.84-3.74) | 0.132 | 0.69 (0.30-1.58) | 0.376 |
| Black African | 1.00 | 1.02 (0.44-2.34) | 0.968 | 2.12 (1.18-3.82) | 0.013 | 0.58 (0.29-1.16) | 0.123 |
| Other | 1.00 | 0.97 (0.42-2.25) | 0.953 | 1.48 (0.78-2.80) | 0.228 | 0.93 (0.55-1.60) | 0.802 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 1.46 (0.70-3.05) | 0.315 | 1.37 (0.76-2.48) | 0.289 | 0.61 (0.33-1.14) | 0.122 |
| ≥10 years in the UK | 1.00 | 2.11 (1.05-4.24) | 0.036 | 1.49 (0.82-2.72) | 0.195 | 1.70 (1.06-2.74) | 0.028 |
| ***Somatic symptom severity (S1)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 0.61 (0.28-1.30) | 0.197 | 1.44 (0.88-2.38) | 0.150 | 2.45 (1.53-3.92) | <0.001 |
| High | 1.00 | 3.65 (1.75-7.64) | <0.001 | 2.67 (1.34-5.33) | 0.006 | 8.91 (5.17-15.34) | <0.001 |
| ***Fair/poor self-rated health (S1)*** | 1.00 | 1.73 (0.79-3.76) | 0.167 | 2.07 (1.14-3.75) | 0.017 | 6.25 (3.96-9.87) | <0.001 |
| ***Perceived functioning limitations due to emotional health (S1)*** | 1.00 | 2.02 (0.98-4.14) | 0.056 | 3.65 (2.19-6.09) | <0.001 | 2.90 (1.81-4.65) | <0.001 |
| ***ADL problems (S1)*** | 1.00 | 4.18 (1.27-13.74) | 0.019 | 2.02 (0.62-6.58) | 0.244 | 14.51 (7.09-29.69) | <0.001 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***High social support (S1)*** | 1.00 | 0.28 (0.15-0.55) | <0.001 | 0.66 (0.34-1.28) | 0.221 | 0.23 (0.14-0.36) | <0.001 |
| ***Social network size (S1)*** | | | | | | | |
| 2 or less contacts | | 1.00 | | 1.00 | | 1.00 | |
| 3-4 contacts | 1.00 | 0.58 (0.22-1.57) | 0.284 | 0.84 (0.27-2.61) | 0.764 | 0.32 (0.16-0.64) | 0.001 |
| 5 or more contacts | 1.00 | 0.13 (0.05-0.34) | <0.001 | 0.49 (0.17-1.43) | 0.190 | 0.06 (0.03-0.12) | <0.001 |
| ***Stressful life events (S1)*** | | | | | | | |
| 0-2 | | 1.00 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 2.52 (1.22-5.20) | 0.012 | 1.21 (0.71-2.05) | 0.487 | 1.44 (0.87-2.36) | 0.153 |
| 6 or more | 1.00 | 3.90 (1.70-8.94) | 0.001 | 2.31 (1.24-4.28) | 0.008 | 4.68 (2.76-7.93) | <0.001 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms

"Stable education or employment" represents the base category in the multinomial regression.

Table C4 Distribution of factors by perceived social functioning trajectories

| | Good : good (n=710) | | Poor : good (n=97) | | Good : poor (n=121) | | Poor : poor (n=115) | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| ***Gender (S1)*** | | | | | | | | |
| Male | 325 | 73.2 | 37 | 8.9 | 40 | 9.4 | 33 | 8.5 |
| Female | 385 | 62.3 | 60 | 9.8 | 81 | 13.7 | 82 | 14.2 |
| ***Age (S1)*** | | | | | | | | |
| 16-29 | 219 | 68.4 | 31 | 9.8 | 38 | 13.1 | 25 | 8.7 |
| 30-39 | 156 | 70.9 | 16 | 7.9 | 26 | 12.3 | 17 | 8.8 |
| 40-49 | 140 | 66.1 | 16 | 8.3 | 20 | 9.9 | 28 | 15.7 |
| 50-59 | 97 | 60.4 | 16 | 10.4 | 15 | 9.4 | 26 | 19.7 |
| 60 or older | 98 | 61.2 | 18 | 10.9 | 22 | 15.2 | 19 | 12.6 |
| ***Relationship status (S1)*** | | | | | | | | |
| Married/cohabitating | 381 | 72.2 | 43 | 8.3 | 49 | 10.0 | 43 | 9.5 |
| Single | 242 | 63.1 | 42 | 11.2 | 47 | 13.2 | 44 | 12.6 |
| Previously in relationship | 87 | 54.4 | 12 | 9.3 | 25 | 16.8 | 28 | 19.5 |
| ***Ethnicity (S1 )*** | | | | | | | | |
| White | 474 | 66.8 | 72 | 10.8 | 68 | 10.6 | 71 | 11.8 |
| Black Caribbean | 51 | 64.1 | 8 | 10.1 | 12 | 14.8 | 8 | 10.9 |
| Black African | 84 | 64.2 | 8 | 6.3 | 19 | 16.1 | 16 | 13.3 |
| Other | 101 | 64.5 | 9 | 6.1 | 22 | 15.4 | 19 | 13.9 |
| ***Migrant (S1)*** | | | | | | | | |
| UK born | 461 | 66.8 | 67 | 10.1 | 72 | 11.7 | 67 | 11.4 |
| <10 years in the UK | 111 | 66.4 | 11 | 7.1 | 22 | 14.3 | 18 | 12.2 |
| ≥10 years in the UK | 121 | 61.4 | 18 | 10.1 | 23 | 11.6 | 30 | 16.9 |
| ***Education (S2)*** | | | | | | | | |
| No qualifications | 53 | 58.5 | 7 | 8.1 | 11 | 13.3 | 17 | 20.1 |
| GCSE | 93 | 52.8 | 18 | 10.5 | 26 | 17.6 | 30 | 19.1 |
| A-level | 160 | 59.9 | 29 | 11.4 | 35 | 13.7 | 35 | 15.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Degree or above | 404 | 75.3 | 43 | 8.5 | 49 | 9.4 | 33 | 6.8 |
| ***Employment (S1+S2)*** | | | | | | | | |
| No adverse employment conditions | 603 | 71.7 | 67 | 8.3 | 88 | 11.5 | 62 | 8.5 |
| Adverse employment conditions | 102 | 44.9 | 30 | 14.0 | 33 | 15.1 | 53 | 25.9 |
| ***Financial strain (S1+S2)*** | | | | | | | | |
| No | 506 | 72.8 | 58 | 8.8 | 63 | 9.5 | 53 | 8.9 |
| Yes | 74 | 43.2 | 19 | 11.1 | 33 | 20.8 | 41 | 24.9 |
| ***Chronic debt (S1+S2)*** | | | | | | | | |
| No | 674 | 68.6 | 85 | 9.2 | 105 | 11.5 | 88 | 10.7 |
| Yes | 30 | 36.4 | 12 | 15.7 | 12 | 16.6 | 24 | 31.3 |
| ***Benefits receipt (S1+S2)*** | | | | | | | | |
| No | 562 | 71.9 | 64 | 8.6 | 79 | 11.2 | 55 | 8.3 |
| Yes | 142 | 49.3 | 33 | 12.0 | 42 | 15.4 | 60 | 23.3 |
| ***MIS (S2)*** | | | | | | | | |
| No | 640 | 80.2 | 63 | 8.3 | 60 | 8.2 | 23 | 3.3 |
| Yes | 70 | 25.4 | 34 | 13.0 | 61 | 23.8 | 92 | 37.8 |
| ***Somatic symptom severity (S1+S2)*** | | | | | | | | |
| Low | 421 | 87.4 | 26 | 5.3 | 25 | 5.7 | 6 | 1.6 |
| Moderate | 229 | 63.6 | 36 | 9.8 | 59 | 16.8 | 32 | 9.9 |
| High | 60 | 26.9 | 35 | 17.4 | 37 | 18.5 | 77 | 37.2 |
| ***Self-rated health (S1+S2)*** | | | | | | | | |
| Good/Very good/ excellent | 613 | 77.2 | 63 | 8.3 | 74 | 9.6 | 35 | 5.0 |
| Fair/poor | 97 | 35.0 | 34 | 13.0 | 47 | 19.6 | 80 | 32.5 |
| ***Daily functioning problems (S1+S2)*** | | | | | | | | |
| None | 666 | 70.8 | 78 | 8.7 | 103 | 11.4 | 77 | 9.1 |
| Any | 19 | 19.5 | 16 | 16.8 | 16 | 20.9 | 38 | 42.8 |
| ***Social support (S1)*** | | | | | | | | |
| Low | 92 | 47.6 | 20 | 10.3 | 31 | 17.3 | 42 | 24.8 |
| High | 611 | 69.9 | 76 | 9.4 | 90 | 11.3 | 72 | 9.5 |
| ***Stressful life events (S1+S2)*** | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0-2 | 137 | 80.3 | 8 | 4.3 | 18 | 10.5 | 8 | 4.9 |
| 3-5 | 326 | 69.1 | 43 | 10.2 | 52 | 11.9 | 35 | 8.9 |
| 6 or more | 222 | 54.4 | 43 | 11.1 | 49 | 13.9 | 72 | 20.6 |

Table C5 Unadjusted associations between factors and perceived social functioning trajectories

| | **Good : good (n=710)** | **Poor : good (n=97)** | | **Good : poor (n=121)** | | **Poor : poor (n=115)** | |
|---|---|---|---|---|---|---|---|
| | RRR | RRR (95% CI) | *p* | RRR (95% CI) | *p* | RRR (95% CI) | *p* |
| ***Female gender (S1)*** | 1.00 | 1.29 (0.82-2.03) | 0.266 | 1.72 (1.12-2.63) | 0.013 | 1.96 (1.27-3.03) | 0.002 |
| ***Age (continuous) (S1)*** | 1.00 | 1.01 (0.99-1.02) | 0.307 | 1.00 (0.99-1.02) | 0.513 | 1.01 (1.00-1.02) | 0.028 |
| ***Relationship status (S1)*** | | | | | | | |
| Married/cohabitating | | 1.00 | | 1.00 | | 1.00 | |
| Single | 1.00 | 1.54 (0.97-2.43) | 0.065 | 1.51 (0.99-2.32) | 0.058 | 1.52 (0.94-2.45) | 0.089 |
| Previously in relationship | 1.00 | 1.48 (0.74-2.95) | 0.265 | 2.25 (1.29-3.92) | 0.005 | 2.72 (1.56-4.73) | <0.001 |
| ***Ethnicity (S1 )*** | | | | | | | |
| White | | 1.00 | | 1.00 | | 1.00 | |
| Black Caribbean | 1.00 | 0.98 (0.43-2.20) | 0.953 | 1.45 (0.73-2.91) | 0.289 | 0.96 (0.42-2.20) | 0.928 |
| Black African | 1.00 | 0.61 (0.28-1.33) | 0.215 | 1.58 (0.88-2.84) | 0.127 | 1.17 (0.60-2.27) | 0.641 |
| Other | 1.00 | 0.59 (0.28-1.26) | 0.170 | 1.50 (0.85-2.65) | 0.158 | 1.22 (0.70-2.12) | 0.488 |
| ***Migrant (S1)*** | | | | | | | |
| UK born | | 1.00 | | 1.00 | | 1.00 | |
| <10 years in the UK | 1.00 | 0.71 (0.36-1.40) | 0.323 | 1.22 (0.70-2.13) | 0.480 | 1.08 (0.60-1.93) | 0.801 |
| ≥10 years in the UK | 1.00 | 1.09 (0.61-1.93) | 0.772 | 1.08 (0.64-1.82) | 0.781 | 1.61 (0.98-2.66) | 0.060 |
| ***Education (S2)*** | | | | | | | |
| No qualifications | 1.00 | 1.24 (0.52-2.92) | 0.631 | 1.82 (0.87-3.80) | 0.109 | 3.79 (1.94-7.42) | <0.001 |
| GCSE | 1.00 | 1.77 (0.96-3.25) | 0.068 | 2.68 (1.55-4.61) | <0.001 | 4.00 (2.27-7.04) | <0.001 |
| A-level | 1.00 | 1.69 (1.00-2.87) | 0.051 | 1.83 (1.14-2.96) | 0.013 | 2.78 (1.65-4.68) | <0.001 |
| Degree or above | | 1.00 | | 1.00 | | 1.00 | |
| ***Adverse employment conditions (S1)*** | 1.00 | 2.69 (1.63-4.45) | <0.001 | 2.09 (1.32-3.32) | 0.002 | 4.89 (3.16-7.57) | <0.001 |
| ***Financial strain (S1+S2)*** | 1.00 | 2.12 (1.18-3.80) | 0.012 | 3.68 (2.24-6.07) | <0.001 | 4.72 (2.87-7.77) | <0.001 |
| ***Chronic debt (S1+S2)*** | 1.00 | 3.22 (1.62-6.40) | <0.001 | 2.71 (1.30-5.64) | 0.008 | 5.51 (3.02-10.04) | <0.001 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***Benefits receipt (S1+S2)*** | 1.00 | 2.03 (1.28-3.24) | 0.003 | 2.00 (1.29-3.09) | 0.002 | 4.12 (2.67-6.36) | <0.001 |
| ***MIS (S2)*** | 1.00 | 4.95 (3.01-8.13) | <0.001 | 9.12 (5.89-14.11) | <0.001 | 35.93 (21.19-60.93) | <0.001 |
| ***Somatic symptom severity (S1+S2)*** | | | | | | | |
| Low | | 1.00 | | 1.00 | | 1.00 | |
| Moderate | 1.00 | 2.51 (1.46-4.32) | <0.001 | 4.06 (2.44-6.74) | <0.001 | 8.67 (3.43-21.94) | <0.001 |
| High | 1.00 | 10.59 (5.86-19.14) | <0.001 | 10.55 (5.85-19.03) | <0.001 | 76.99 (30.98-191.29) | <0.001 |
| ***Fair/poor self-rated health (S1+S2)*** | 1.00 | 3.46 (2.11-5.68) | <0.001 | 4.47 (2.87-6.98) | <0.001 | 14.47 (9.05-23.16) | <0.001 |
| ***Daily functioning problems (S1+S2)*** | 1.00 | 7.05 (3.40-14.61) | <0.001 | 6.65 (3.25-13.61) | <0.001 | 17.03 (9.22-31.45) | <0.001 |
| ***High social support (S1)*** | 1.00 | 0.62 (0.35-1.10) | 0.100 | 0.44 (0.28-0.72) | <0.001 | 0.26 (0.16-0.41) | <0.001 |
| ***Stressful life events (S1+S2)*** | | | | | | | |
| 0-2 | | 1.00 | | 1.00 | | 1.00 | |
| 3-5 | 1.00 | 2.75 (1.24-6.10) | 0.013 | 1.31 (0.72-2.38) | 0.375 | 2.10 (0.94-4.68) | 0.070 |
| 6 or more | 1.00 | 3.81 (1.72-8.48) | 0.001 | 1.96 (1.07-3.60) | 0.031 | 6.19 (2.86-13.43) | <0.001 |

RRR, relative risk ratio; CI, confidence interval; MIS, mental illness symptoms

"Good : good" represents the base category in the multinomial regressions.